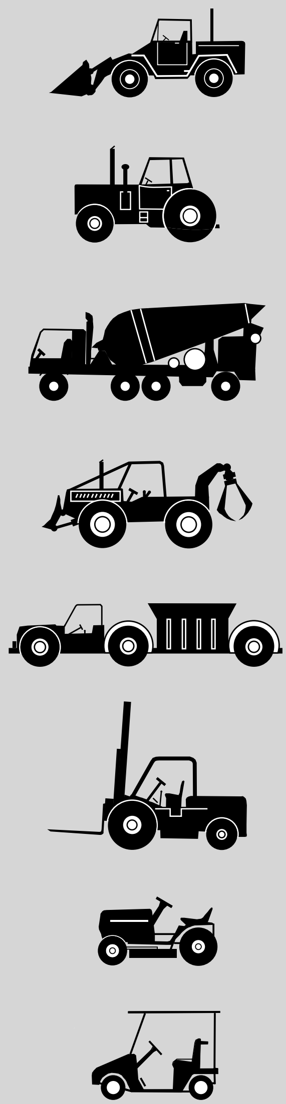
Maintenance and Service manual

TE27 / 32

POWERSHIFT TRANSMISSION
4 SPEED
SHORT DROP





SPICER OFF-HIGHWAY PRODUCTS DIVISION

DANA

Manual: 8100102
CD-ROM: 8100101

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TOWING OR PUSHING

Before towing the vehicle, be sure to lift the rear wheels off the ground or disconnect the driveline to avoid damage to the transmission during towing.

NOTE:
Because of the design of the hydraulic system, the engine cannot be started by pushing or towing.

FOREWORD

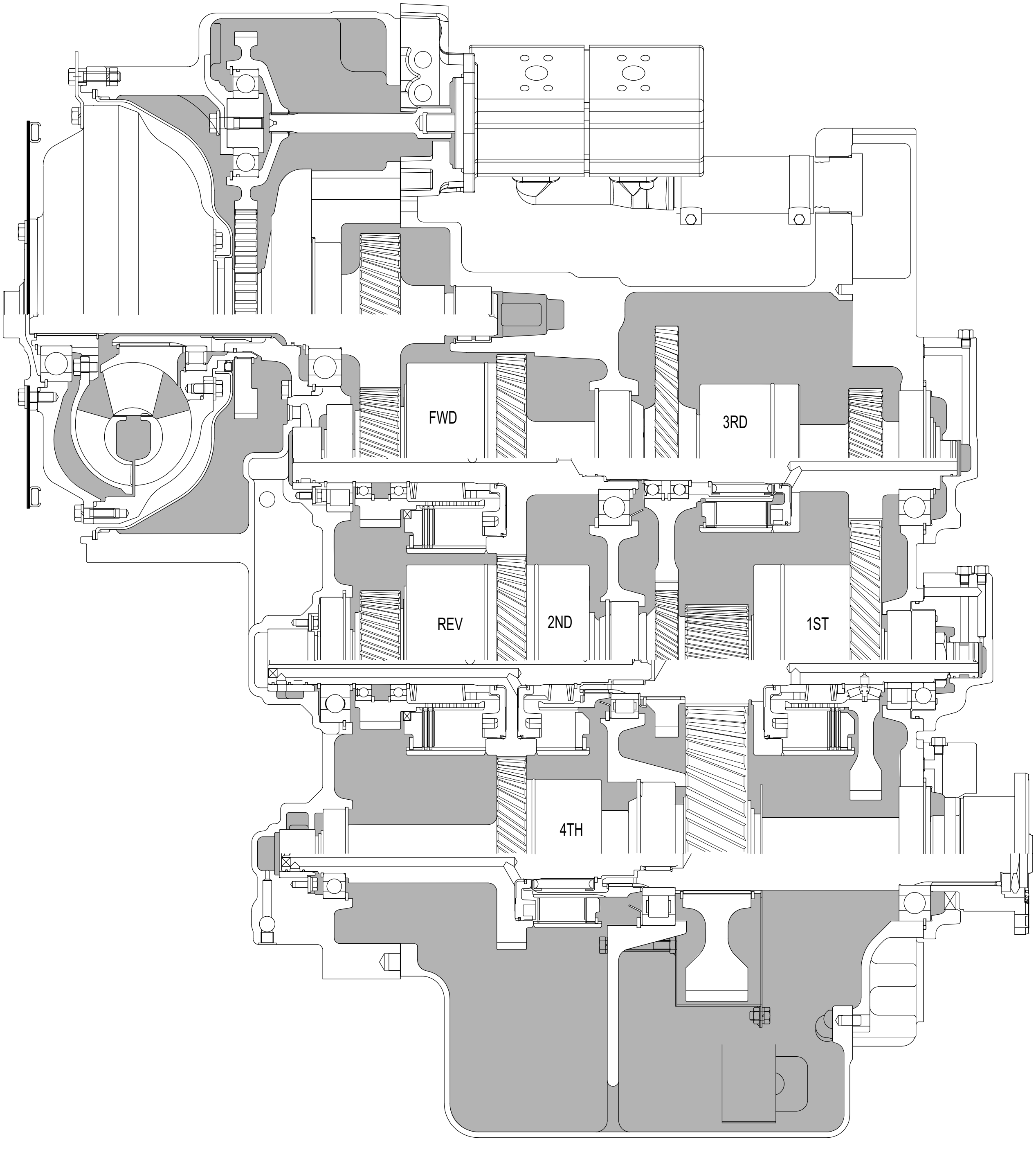
This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the **SPICER OFF-HIGWAY PRODUCTS** product.

Extreme care has been exercised in the design, selection of materials, and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated, will be reimbursed many times in low cost operation and trouble-free service.

In order to become familiar with the various parts of the product, its principle of operation, troubleshooting and adjustments, it is urged that the mechanic studies the instructions in this manual carefully and uses it as a reference when performing maintenance and repair operations.

Whenever repair or replacement of component parts is required, only **SPICER OFF-HIGHWAY PRODUCTS** approved parts as listed in the applicable parts manual should be used. Use of “will-fit” or non-approved parts may endanger proper operation and performance of the equipment. **SPICER OFF-HIGHWAY PRODUCTS** does not warrant repair or replacement parts, nor failures resulting from the use of parts which are not supplied or approved by **SPICER OFF-HIGHWAY PRODUCTS**.

IMPORTANT
ALWAYS FURNISH THE DISTRIBUTOR WITH THE SERIAL AND MODEL NUMBER WHEN ORDERING PARTS.



FWD
3RD
REV
2ND
1ST
4TH

1. SAFETY PRECAUTIONS

To reduce the chance of personal injury and/or property damage, the following instructions must be carefully observed.

Proper service and repair are important to the safety of the service technician and the safe reliable operation of the machine. If replacement parts are required the part must be replaced by a spare part which has the same part number or with an equivalent part. DO NOT USE A SPARE PART OF LESSER QUALITY.

The service procedures recommended in this manual are effective methods for performing service and repair. Some of these procedures require the use of tools specifically designed for the purpose.

Accordingly, anyone who intends to use a spare parts, service procedure or tool, which is not recommended by SPICER OFF-HIGHWAY PRODUCTS, must first determine that neither his safety nor the safe operation of the machine will be jeopardized by the spare part, service procedure or tool selected.

IMPORTANT
It is important to note that this manual contains various 'CAUTIONS' and 'NOTES' that must be carefully observed in order to reduce the risk of personal injury during service or repair, or the possibility that improper service or repair may damage the unit or render it unsafe.
It is also important to understand that these 'CAUTIONS" and 'NOTES' are not exhaustive, because it is impossible to warn about all the possible hazardous consequences that might result from failure to follow these instructions.

2. CLEANING, INSPECTION AND LEGEND SYMBOLS

2.1 CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved up and down slowly until all old lubricant and foreign material is dissolved and parts are thoroughly cleaned.

⚠ **CAUTION**
Care should be exercised to avoid skin rashes, fire hazards, and inhalation of vapors when using solvent type cleaners.

2.1.1 Bearings

Remove bearings from cleaning fluid and strike flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning. Do not spin bearings when drying. Bearings may be rotated slowly by hand to facilitate drying process.

2.1.2 Housings

Clean interior and exterior of housings, bearing caps, etc…, thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions providing these parts do not have ground or polished surfaces.
Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

⚠ **CAUTION**
Care should be exercised to avoid inhalation of vapors and skin rashes when using alkali cleaners.

All parts cleaned must be thoroughly dried immediately by using moisture-free compressed air or soft, lintless absorbent wiping rags free of abrasive materials such as metal fillings, contaminated oil, or lapping compound.

2.2 INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

2.2.1 Bearings

Carefully inspect all rollers: cages and cups for wear, chipping, or nicks to determine fitness of bearings for further use. Do not replace a bearing cone or cup individually without replacing the mating cup or cone at the same time. After inspection, dip bearings in Automatic Transmission Fluid and wrap in clean lintless cloth or paper to protect them until installed.

2.2.2 Oil Seals, Gaskets, Etc.

Replacement of spring load oil seals, “O” rings, metal sealing rings, gaskets, and snap rings is more economical when unit is disassembled than premature overhaul to replace these parts at a future time.
Further loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed. Cutting, scratching, or curling under of lip of seal seriously impairs its efficiency. When assembling new metal type sealing rings, these should be lubricated with coat of chassis grease to stabilize rings in their grooves for ease of assembly of mating members. Lubricate all “O” rings and seals with recommended type Automatic Transmission Fluid before assembly.

2.2.3 Gears and Shafts

If magna-flux process is available, use process to check parts. Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks, or scores. If gear teeth show spots where case hardening is worn through or cracked, replace with new gear. Small nicks may be removed with suitable hone. Inspect shafts and quills to make certain they are not sprung, bent, or splines twisted, and that shafts are true.

2.2.4 Housing, Covers, etc.

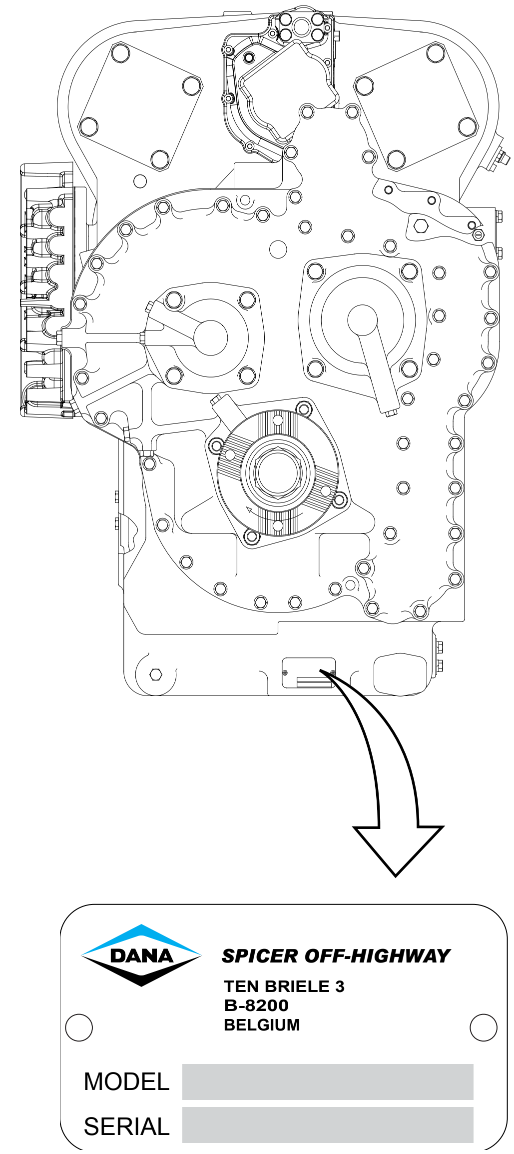
Inspect housings, covers and bearing caps to ensure that they are thoroughly clean and that mating surfaces, bearing bores, etc…, are free from nicks or burrs. Check all parts carefully for evidence of cracks or conditions which would cause subsequent oil leaks or failures.

2.3 LEGEND SYMBOLS

Symbol	Description
	Smontaggio di sottogruppi Disassembly of assembly groups
	Montaggio di sottogruppi Reassemble to from assembly group
	Smontaggio di particollari ingombranti Remove obstruction parts
	Montaggio di particollari ingombranti Reinstall - remount parts which had obstructed disassembly
	Attenzione, indicazione importante Attention! important notice
	Controllare regolare p.e. coppie, misure, pressione etc. Check - adjust e.g. torque, dimensions, pressures etc.
	T = Attrezzature speciali P = Pagina T = Special tool P = Page
	Rispettare direzione di montaggio Note direction of installation
	Controllare esaminare controllo visuale Visual inspection
	Eventualimente riutilizzabile (sostituire se necessario) Possibly still serviceable, renew if necessary

Symbol	Description
	Sostituire con ogni montaggio Renew at each reassembly
	Togliere - mettere la sicura Unlock - lock e.g. split pin, locking plate, etc.
	Mettere la sicura, incollare (mastice liquido) Lock - adhere (liquid sealant)
	Evitare danni ai materiali, danni ai pezzi Guard against material damage, damage to parts
	Marchiari prima dello smontaggio (per il montaggio) Mark before disassembly, observe marks when reasembl.
	Carricare riempire (olio - lubrificante) Filling - topping up - refilling e.g. oil, cooling water, etc.
	Scarricare olio, lubrificante Drain off oil, lubricant
	Tendere Tighten - clamp ; tightening a clamping device
	Insere pressione nel circuito idraulico Apply pressure into hydraulic circuit
	Pulire To clean

3. TECHNICAL SPECIFICATIONS



3.1 IDENTIFICATION OF THE UNIT

1. Model and type of the unit
2. Serial number

3.2 WEIGHT, DIMENSIONS, OIL CAPACITY

Weight (dry)	865 Kg [1903 lbs]
Max. length	940 mm [37.0"]
Max. width	665 mm [26.2"]
Max. heigth	970 mm [38.2"]

Oil capacity
60 liter [15.9 US gallon] without cooler and hydraulic lines.
Consult Operators manual on applicable machine for system capacity.

3.3 TIGHTENING TORQUES

3.3.1 TORQUE SPECIFICATIONS FOR LUBRICATED OR PLATED SCREW THREADS

GRADE 5

NOM. SIZE	FINE THREAD LB - FT	FINE THREAD N - m	COARSE THREAD LB - FT	COARSE THREAD N - m
7500	223 - 245	302 - 332	200 - 220	271 - 298
6250	128 - 141	174 - 191	113 - 124	153 - 168
5625	91 - 100	123.4 - 135.5	82 - 90	111.2 - 122.0
5000	64 - 70	86.8 - 94.9	57 - 63	77.3 - 85.4
4375	41 - 45	55.6 - 61.0	37 - 41	50.2 - 55.5
3750	26 - 29	35.3 - 39.3	23 - 25	31.2 - 33.8
3125	16 - 20	21.7 - 27.1	12 - 16	16.3 - 21.6
2500	9 - 11	12.3 - 14.9	8 - 10	10.9 - 13.5

GRADE 8

NOM. SIZE	FINE THREAD LB - FT	FINE THREAD N - m	COARSE THREAD LB - FT	COARSE THREAD N - m
7500	315 - 347	427 - 470	282 - 310	382 - 420
6250	180 - 198	244 - 268	159 - 175	216 - 237
5625	128 - 141	173.6 - 191.1	115 - 127	156.0 - 172.2
5000	90 - 99	122.1 - 134.2	80 - 88	108.5 - 119.3
4375	58 - 64	78.7 - 86.7	52 - 57	70.6 - 77.2
3750	37 - 41	50.2 - 55.5	33 - 36	44.8 - 48.8
3125	28 - 32	38.0 - 43.3	26 - 30	35.3 - 40.6
2500	11 - 13	15.0 - 17.6	9 - 11	12.3 - 14.9

NOM. SIZE	CLASS 8.8		CLASS 10.9		GRADE 12.9	
	COARSE THREAD LBF - FT	[N.m]	COARSE THREAD LBF - FT	[N.m]	COARSE THREAD LBF - FT	[N.m]
M5	4 - 5	[5 - 6]	5 - 6	[7 - 8]	6 - 7	[8 - 10]
M6	6 - 7	[8 - 10]	9 - 11	[12 - 15]	10 - 12	[13 - 16]
M8	15 - 18	[20 - 25]	22 - 26	[30 - 35]	26 - 30	[35 - 40]
M10	30 - 37	[40 - 50]	44 - 48	[60 - 65]	48 - 55	[65 - 75]

THREAD SIZE	TORQUE	
	LBF - FT	[N.m]
M10 x 1	6 - 7	[8 - 10]
M14 x 1.5	7 - 9	[10 - 12]
M18 x 1.5	25 - 30	[34 - 41]
M22 x 1.5	35 - 44	[48 - 60]
M33 x 2	83 -103	[112 - 140]

3.3.2 ELASTIC STOP NUT TORQUE

THREAD SIZE	LBF - FT	[N . m]
9/16" - 18	12 - 15	[16 - 20]
3/4" - 16	20 - 25	[27 - 34]

3.3.3 TORQUE TABLES FOR O-RING PLUGS

THREAD SIZE	TORQUE	
NPTF	LBF - FT	[N.m]
1/16 x 27	5 - 7	[7 - 8]
1/8 x 27	7 - 10	[9 - 14]
1/4 x 18	15 - 20	[20 - 27]
3/8 x 18	25 - 30	[34 - 41]
1/2 x 14	30 - 35	[41 - 47]
3/4 x 10	40 - 45	[54 - 61]

3.3.4 TORQUE TABLE FOR PIPE PLUGS

THREAD SIZE	TORQUE	
	LBF - FT	[N.m]
M18 x 1.5 6H	25 - 30	[34 - 41]
M26 x 1.5 6H	45 - 50	[61 - 68]

3.4 PRESSURE & TEMPERATURE SPECIFICATIONS

Normal operating temperature 70 - 120°C [158-248° F] measured at temperature check port to cooler (port 71 - **).

maximum allowed transmission temperature 120° C [248° F].

Transmission regulator presure (*) - neutral - port 31 (**).
at 600 RPM 17 bar [246.5 PSI] minimum
at 2650 RPM 22 bar [319.0 PSI] maximum

Pump flow (*)
System pump flow:100.5 l/min [26.34 GPM] at 1973 RPM.
Lube pump flow: 85.1 l/min [22.48 GPM] at 1973 RPM.

Clutch pressures (*)

1st clutch	port 41 (**)
2nd clutch	port 42 (**)
3rd clutch	port 43 (**)
Fwd clutch	port 45 (**)
Rev clutch	port 46 (**)

at 2200 RPM
21.5 - 25.5 bar [311.8 - 369.8 PSI] activated.

Filter bypass valve set at 4.1 to 4.5 bar (*) [59.4 to 65.2 PSI].

Lube pressure (*) port 33 1.76 - 2.64 bar [25.5 - 38.2 PSI] at 73 l/min. [19.2 GPM] converter flow.

Internal total leakage at 1000 engine RPM

Fwd/Rev	4 l/min [1 GPM]
1st	10.5 l/min [2.7 GPM]
2nd/3rd/4th	4 l/min [1 GPM]

Safety valve: cracking pressure (*) 9.0 bar [130.5 PSI]

To cooler (convereter out) pressure (*) port 32 - 2 bar min. [29.0 PSI] at 2000 RPM and max. 5.0 bar [72.5 PSI] at no load governed speed.

(*) All pressures and flows to be measured with oil temperature of 82 - 93° C [180-200° F]
(**) Refer to section troubleshooting for check port identification.

3.5 ELECTRICAL SPECIFICATIONS

Electronic controlled modulation valves
VFS 2nd/4th - VFS 1st/3rd - VFS Fwd -VFS Rev
coil resistance 4.35 ± 0.35 Ω at 25° C [77° F]

On/Off Solenoids
Total neutral and 1st/3rd & 2nd/4th range solenoids
Coil resistance 12V - 28 ± 2 Ω at 20° C [68° F]
Coil resistance 24V - 28 ± 2 Ω at 20° C [68° F]

Speed sensor

Type	Magneto resistive sensor.
Sensing distance	0- 1.8 mm [0 - 0.07"]
Sensor signal	generates a square current with a fixed amplitude changing between 7 and 14 mA.

3.6 HYDRAULIC COOLER LINES SPECIFICATIONS.

Minimum 37 mm [1.25"] internal diameter for lines and fittings.
Suitable for operation from ambient to 120° C [248° F] continuous operating temperature.
Must withstand 30 bar [435 PSI] continuous pressure and 45 bar [652 PSI] intermittent surges.
Conform SAE J1019 and SAE J517, 100RI.

4. MAINTENANCE

4.1. OIL SPECIFICATION

4.1.1 Recommended lubricants

- **Only Dexron* III is approved to use**

SUMP PREHEATERS

Preheat the transmission fluid to the mimimum temperature for the oil viscosity used before engine startup.

NORMAL OIL CHANGE INTERVAL

Drain and refill system every 1000 hrs for average environmental and duty cycle conditions. Severe or sustained high operating temperature or very dusty atmospheric conditions will result in accelerated detioration or contamination. Judgement must be used to determine the required change intervals for extreme conditions.

EXTENDED OIL CHANGE INTERVAL

Extended oil service life may result when using synthetic fluids. Appropriate change intervals should be determined for each transmission by measuring oil oxidation and wear metals over time, to determine a baseline. Wear metals analysis can provide useful inforamtion but a transmission should not be removed from service based solely on this analysis.

FILTERS

Service oil filter element every 500 hrs under normal envirronmental and duty cycle conditions.

4.2 MAINTENANCE INTERVALS

4.2.1 Daily

Check oil level daily with engine running at idle (600 RPM) and oil at 82 - 93 °C (180-200 F).

Maintain oil level at full mark.

4.2.2 Normal drain period

Normal drain period and oil filter element change are for average environment and duty cycle condition.

Severe or sustained high operating temperature or very dusty atmospheric conditions will cause accelerated deterioration and contamination.

For extreme conditions judgement must be used to determine the required change intervals.

Every 500 hours

Change oil filter element.

Every 1000 hours

Drain and refill system as follows (Drain with oil at 65 - 93 °C [150 - 200 F]):

1. Drain transmission.
2. Remove and discard filter. Install new filter.
3. Refill transmission to FULL mark.

4. Run engine at 500 - 600 RPM to prime convertor and lines.
5. Recheck level with engine running at 500 - 600 RPM and add oil to bring level to LOW mark.
   When oil temperature is hot 82.2 - 93.3 °C (180- 200 F) make final oil level check and adjust if ecessary to bring oil level to FULL mark.

NOTE

IT IS RECOMMENDED THAT OIL FILTER BE CHANGED AFTER 100 HOURS OF OPERATION ON NEW, REBUILT OR REPAIRED UNIT.

4.3 SERVICING MACHINE AFTER COMPONENTS OVERHAUL

The transmission, torque converter, and its allied hydraulic system are important links in the driveline between the engine and the wheels. The proper operation of either unit depends greatly on the condition and operation of the other. Therefore, whenever repair or overhaul of one unit is performed, the balance of the system must be considered before the job can be considered complete.
After the overhauled or repaired transmission has been installed in the machine, the oil cooler, and connecting hydraulic system must be thoroughly cleaned. This can be accomplished in several manners and a degree of judgement must be exercised as to the method employed.

The following are considered the minimum steps to be taken:

1. Drain entire system thoroughly.
2. Disconnect and clean all hydraulic lines. Where feasible hydraulic lines should be removed from machine for cleaning.
3. Replace oil filter element.
4. The oil cooler must be thoroughly cleaned. The cooler should be “back flushed” with oil and compressed air until all foreign material has been removed. Flushing in direction of normal oil flow will not adequately clean the cooler. If necessary, cooler assembly should be removed from machine for cleaning, using oil, compressed air, and steam cleaner for that purpose. DO NOT use flushing compounds for cleaning purposes

IMPORTANT

DO NOT USE FLUSHING COMPOUNDS FOR CLEANING PURPOSES.

5. Reassemble all components and use only type oil recommended for lubrication section.
   Fill transmission through filler opening until fluid comes up to the oil level check port.

   Run engine 2 minutes at 500+600 R.P.M. to prime torque converter and hydraulic lines.
   Recheck level of fluid in transmission with engine running at idle (500-600 R.P.M.).

   Add quantity necessary to bring fluid level to oil level check port.

   Recheck with hot oil (180-200 F) 82-93° C.

6. Recheck all drain plugs, lines, connections, etc., for leaks and tighten where necessary.

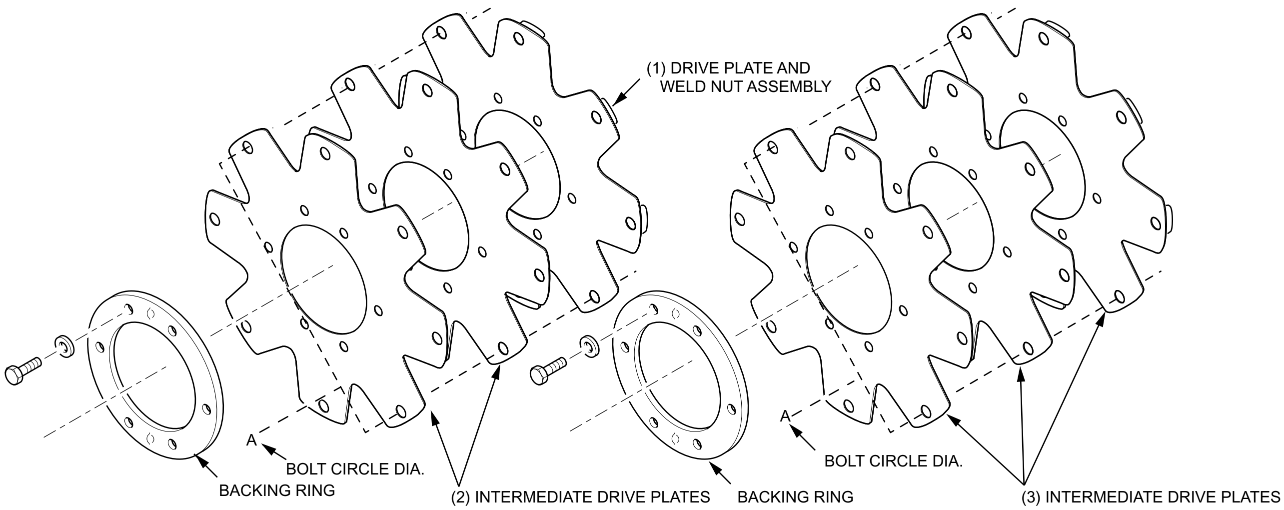
* DEXRON is a registered trademark of GENERAL MOTORS CORPORATION

5. INSTALLATION DETAILS

5.1 CONVERTER DRIVE COUPLING

Measure the "A" dimension (bolt circle diameter) and order drive plate kit listed below.

Note three (3) kits have (2) intermediate drive plates and one (1) drive plate and weld nut assembly.
Three (3) kits with three intermediate drive plates.



"A" Dimension (Bolt circle diameter)

- 15" (381.0 mm) diameter
- 16" (406.4 mm) diameter
- 17" (431.8 mm) diameter

Each kit will include the following parts:
- 2 Intermediate drive plates
- 1 Drive plate and weld nut assembly
- 1 Backing ring
- 6 Mounting screws
- 6 Lock washers
- 1 Instruction sheet

"A" Dimension (Bolt circle diameter)

- 15" (381.0 mm) diameter
- 16" (406.4 mm) diameter
- 17" (431.8 mm) diameter

Each kit will include the following parts:
- 3 Intermediate drive plates
- 1 Backing ring
- 6 Mounting screws
- 6 Lock washers
- 1 Instruction sheet

Position drive plate and weld nut assembly on torque converter assembly with welded nuts toward converter. Align intermediate drive plates and backing ring with holes in torque converter assembly.

NOTE:

Two dimples 180° apart in backing ring must be out (Toward the engine flywheel).
Install cap screws and washers. Tighten 40 - 50 Nm [30 to 37 lbft] torque.

5.2 TRANSMISSION TO ENGINE INSTALLATION PROCEDURE

1. Remove all burrs from flywheel mounting face and nose pilot bore. Clean drive plate surface with solvent.
2. Check engine flywheel & housing for conformance to standard SAE No. 3 per SAE J927 and J1033 tolerance specifications for pilot bore size, pilot bore runout and mounting face flatness. Measure and record engine crankshaft end play (Fig. 1).
3. Install two 63,50 mm (2.50”) long transmission to flywheel housing guide studs in the engine flywheel housing as shown. Rotate the engine flywheel to align a drive plate mounting screw hole with the flywheel housing access hole (Fig. 2).

*4. Install a 101,60 mm (4.00”) long drive plate locating stud .3750-24 fine thread in a drive plate nut. Align the locating stud in the drive plate with the flywheel drive plate mounting screw hole positioned in step No. 3.

5. Rotate the transmission torque converter to align the locating stud in the drive plate with the flywheel drive plate mounting screw hole positioned in step No. 3. Locate transmission on flywheel housing.

   Aligning drive plate to flywheel and transmission to flywheel housing guide studs. Install transmission to flywheel housing screws. Tighten screws to specified torque. Remove transmission to engine guide studs. Install remaining screws and tighten to specified torque.

*6. Remove drive plate locating stud.

7. Install drive plate attaching screw and washer. Snug screw but **do not tighten**. Some engine flywheel housings have a hole located on the flywheel housing circumference in line with the drive plate screw access hole. A screwdriver or pry bar used to hold the drive plate against the flywheel will facilitate installation of the drive plate screws. Rotate the engine flywheel and install the remaining seven (7) flywheel to drive plate attaching screws. Snug screws but do not tighten. After all eight (8) screws are installed.
   Torque each one 35 to 39 N.m. (26- 29ft.lbs.). This will require tightening each screw and rotating the engine flywheel until the full amount of eight (8) screws have been tightened to specified torque.
8. Measure engine crankshaft end play after transmission has been completely installed on engine flywheel. This value must be within 0,025 mm (0.001”) of the end play recorded in step No. 2.

* Does not apply to units having 3 intermediate drive plates. See Fig.4.

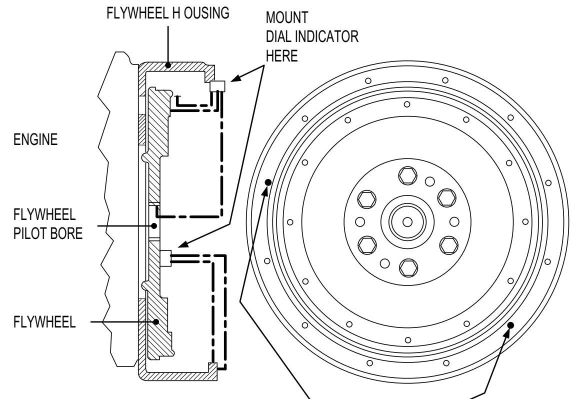


FIG. 1

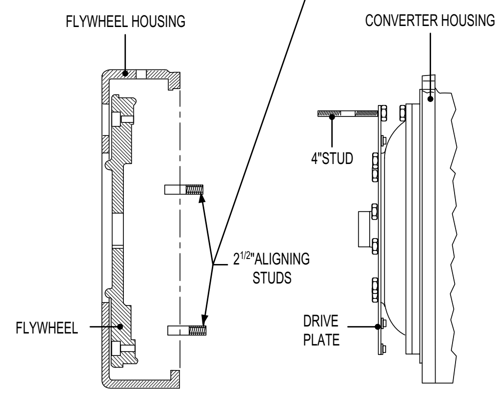


FIG. 2

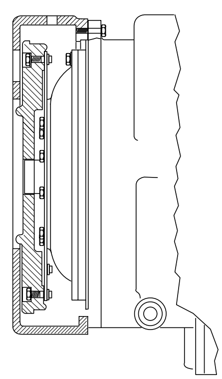


FIG. 3

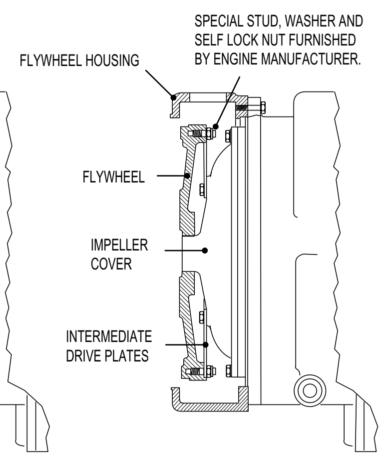


FIG.4

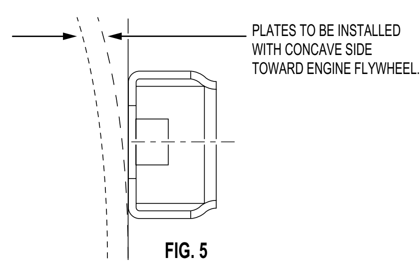
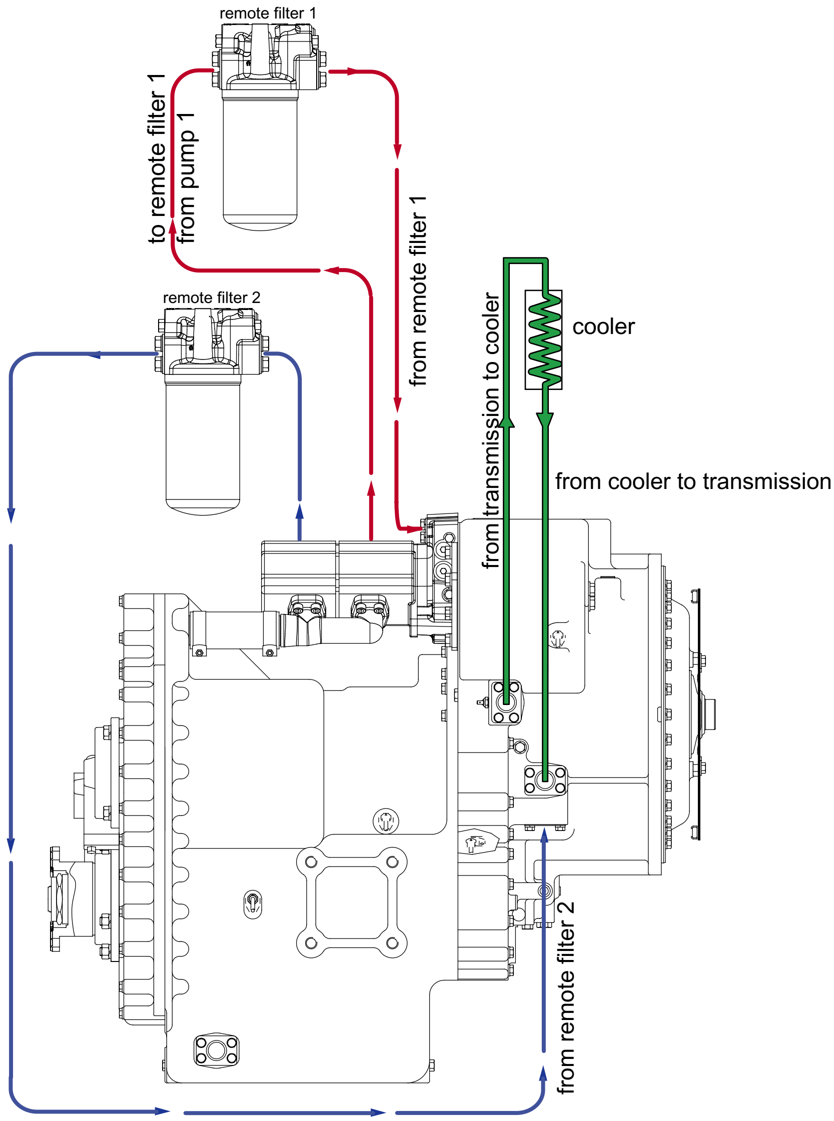


FIG. 5

5.3 EXTERNAL PLUMBING

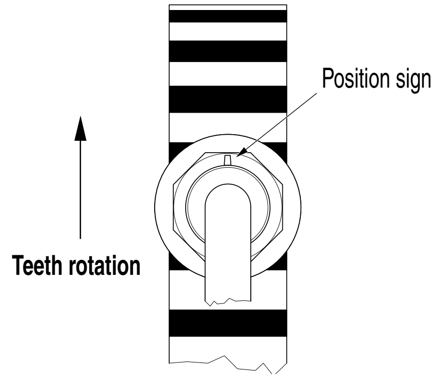


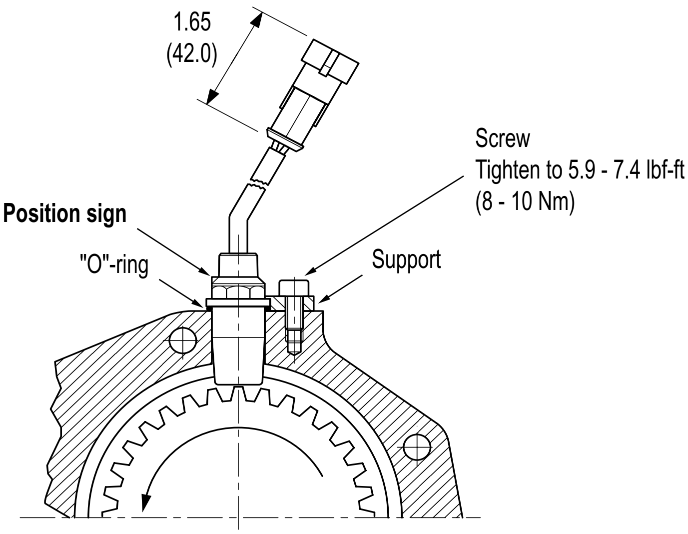
5.3.1 Cooler & filter lines specifications

- Minimum 32 mm [1.25 inch] internal diameter for lines and fittings.
- Suitable for operation from ambient to 120° C [248° F] continuous operating temperature.
- Must withstand 30 bar [435psi] continuous pressure and with 40 bar [652 psi] intermittent surges.
- Conform SAE J1019 and SAE J517,100RI.

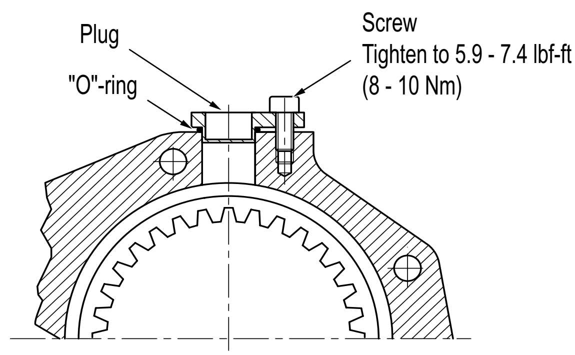
5.4 SPEED SENSOR INSTALLATION

On the sensor body there is a small plastic triangular position sign.
Make sure the position sign on the sensor points as shown below
in the direction of the movement of the gearteeth (Teeth rotation as shown).





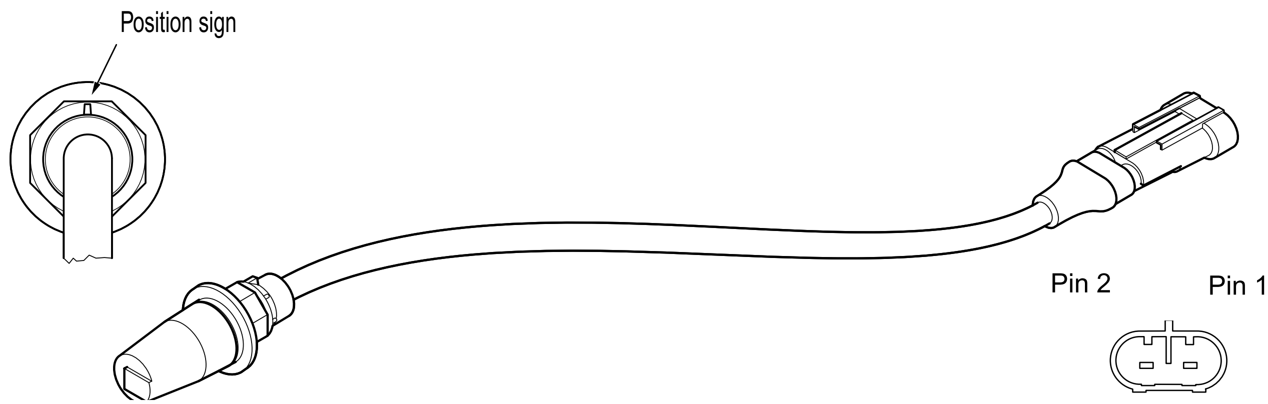
Sensor installed



Hole plugged

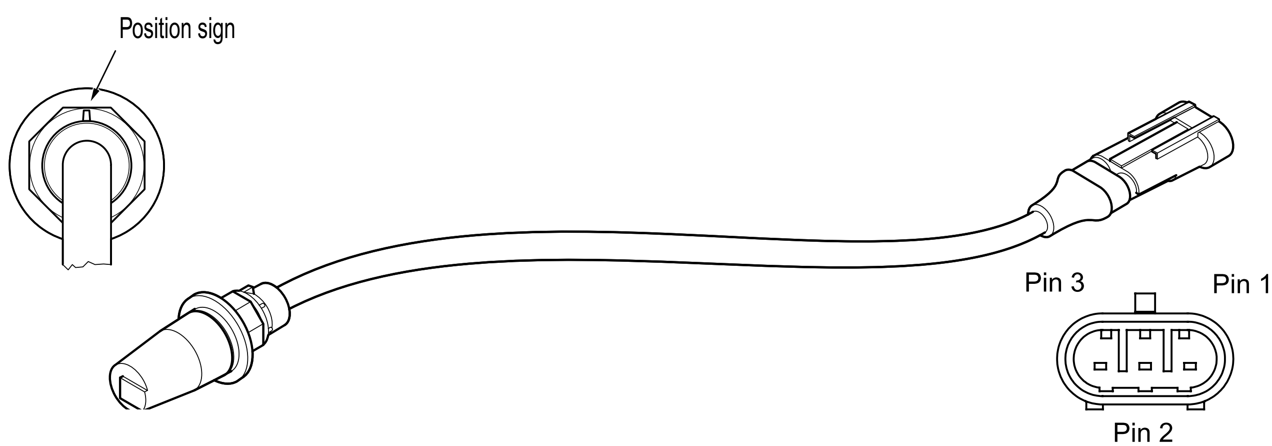
Sensor position on transmission

5.4 SPEED SENSOR INSTALLATION (CONTINUED)



The magneto resistive sensor generates a square wave current with a fixed amplitude changing between 7 mA and 14 mA. The sensor has an integrated AMP superseal 2 pin connector. The two pins are numbered 1 and 2. Following table shows the relation between wire colour, pin number and connection.

Colour	Pin Number	Function	Connection
BROWN	1	Current Input	Hot wire
BLUE	2	Current Output	Ground Wire



The magneto resistive sensor generates a square wave current with a fixed amplitude changing between 7 mA and 14 mA. The sensor has an integrated AMP superseal 2 pin connector. The two pins are numbered 1 and 2. Following table shows the relation between wire colour, pin number and connection.

Colour	Pin Number	Function	Connection
RED	1	Current Input	Hot Wire
BLUE	2	Current Output	Ground Wire
GREEN	3	Temp. Input	Hot Wire

NOTE:

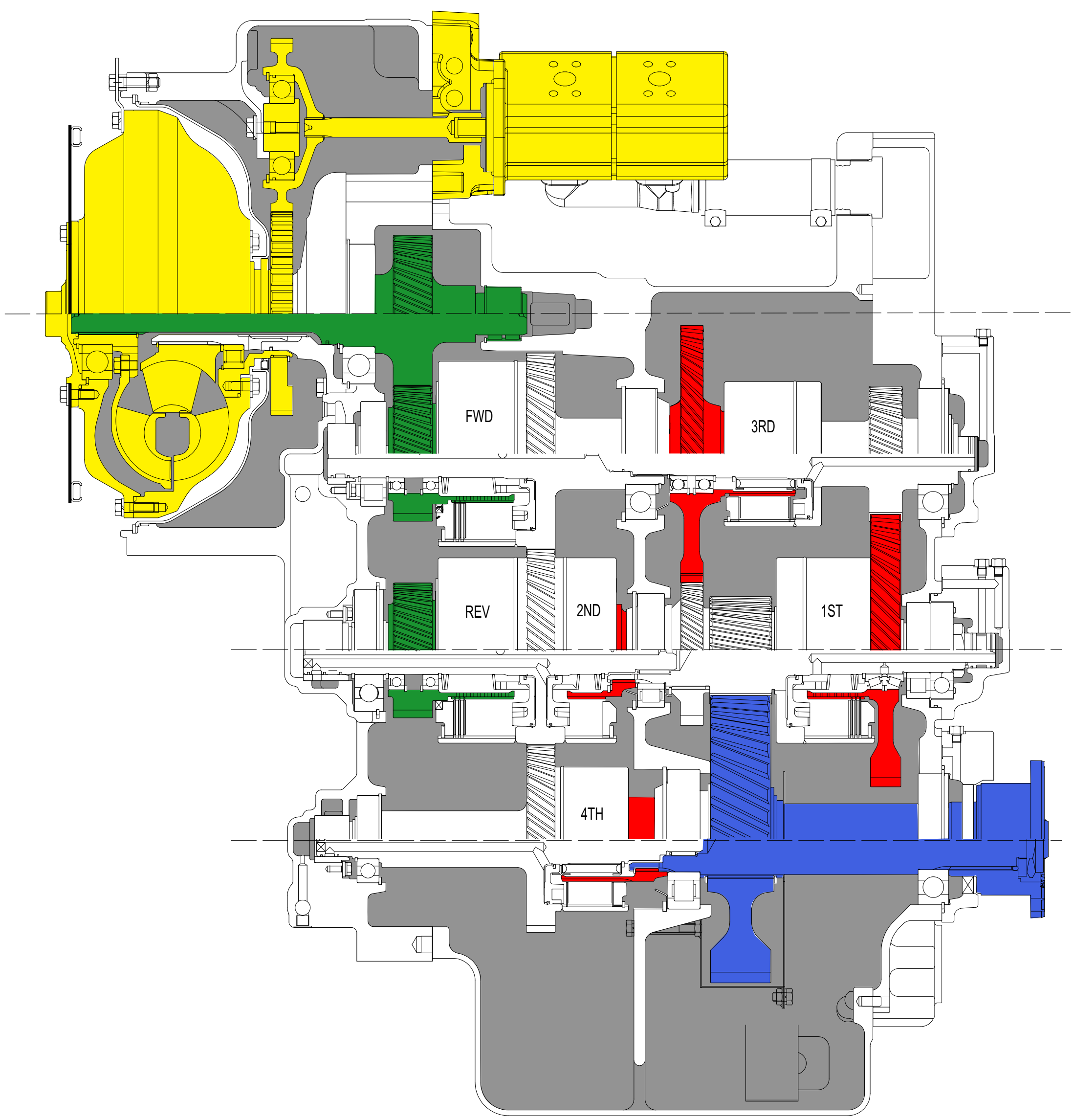
THE SENSOR WIRES HAVE A POLARITY.
BE SURE TO CORRECTLY OBSERVE SENSOR POLARITIES, AS WRONG CONNECTIONS WILL DEACTIVATE THE SENSOR.

6. TRANSMISSION OPERATION

6.1 THE TRANSMISSION ASSEMBLY

Basically the transmission is composed of five main assemblies:

1. (yellow) The converter, pump drive section and pressure regulating valve.
2. (green) The input shaft and directional clutches.
3. (red) The range clutches.
4. (blue) The output section.
5. (brown) The transmission control valve.



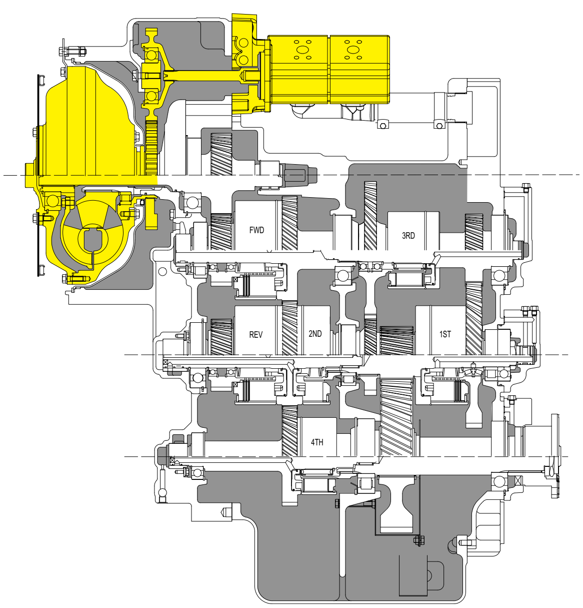
6.1.1 The converter, pump drive section and pressure regulating valve

Engine power is transmitted from the engine flywheel to the impeller through the impeller cover.
This element is the pump portion of the hydraulic torque converter and is the primary component which starts the oil flowing to the other components which results in torque multiplication. This element can be compared to a centrifugal pump, that picks up fluid at its centre and discharges it at the outer diameter.
The torque converter turbine is mounted opposite the impeller and is connected to the turbine shaft of the torque converter. This element receives fluid at its outer diameter and discharges it at its centre.
The reaction member of the torque converter is located between and at the centre of the inner diameters of the impeller and turbine elements. Its function is to take the fluid which is exhausting from the inner portion of the turbine and change its direction to allow correct entry for recirculation into the impeller element.

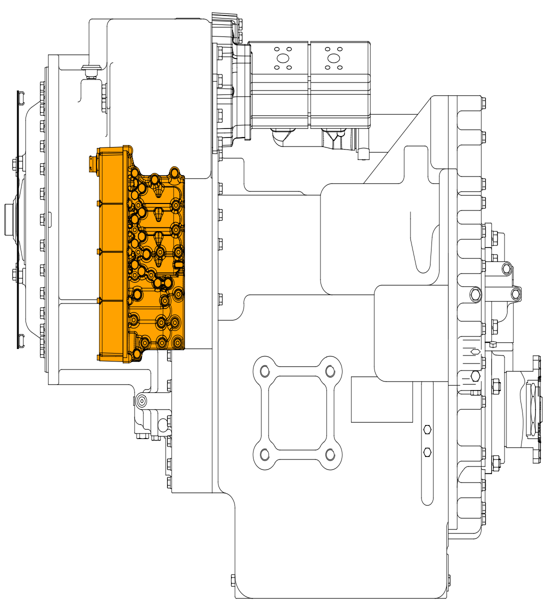
This recirculation will make the converter to multiply torque.
The torque multiplication is function of the blading (impeller, turbine and reaction member) and the converter output speed (turbine speed). The converter will multiply engine torque to its designed maximum multiplication ratio when the turbine shaft is at zero RPM (stall).

Therefore we can say that as the turbine shaft is decreasing in speed, the torque multiplication is increasing.

The hydraulic pump is connected with the pump drive gear. This pump drive gear is driven by the impeller hub gear. Since the impeller hub gear is connected with the impeller cover, the pump speed is in direct relation with the engine speed.



CONVERTER SECTION



CONTROL VALVE

6.1.2 The input shaft and directional clutches

The turbine shaft driven from the turbine transmits power to the directional clutches (fwd/rev.).
These clutches consist of a drum with internal splines and a bore to receive a hydraulic actuated piston.
The piston is oil tight by the use of sealing rings. The steel discs with internal splines, and friction discs with external splines, are alternated until the required total is achieved.

A back-up plate is then inserted and secured with a retainer ring. A hub with outer diameter splines is inserted into the splines of discs with teeth on the inner diameter. The discs and hub are free to increase in speed or rotate in the opposite direction as long as no pressure is present in that specific clutch.
To engage the clutch, the solenoid will direct oil under pressure through tubes and passages to the selected clutch shafts.

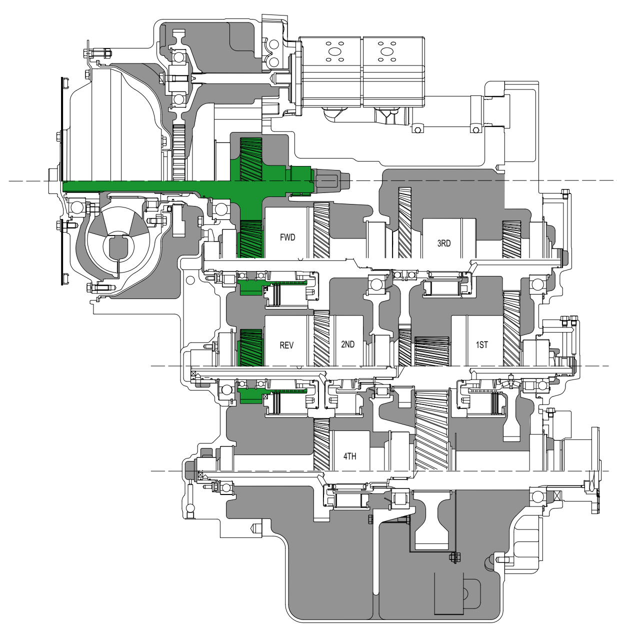
Oil sealing rings are located on the clutch shafts. These rings direct the oil through a drilled passage in the shaft to the desired clutch.

Pressure of the oil forces the piston and discs against the back-up plate. The discs with splines on the outer diameter clamping against discs with teeth on the inner diameter enables the drum and hub to be locked together and allows them to drive as one unit.

When the clutch is released, a return spring will push the piston back and oil will drain back via the shift spool, the bleed valve or holes in the clutch piston into the transmission sump.

These bleed valves will only allow quick escape of oil when the pressure to the piston is released.

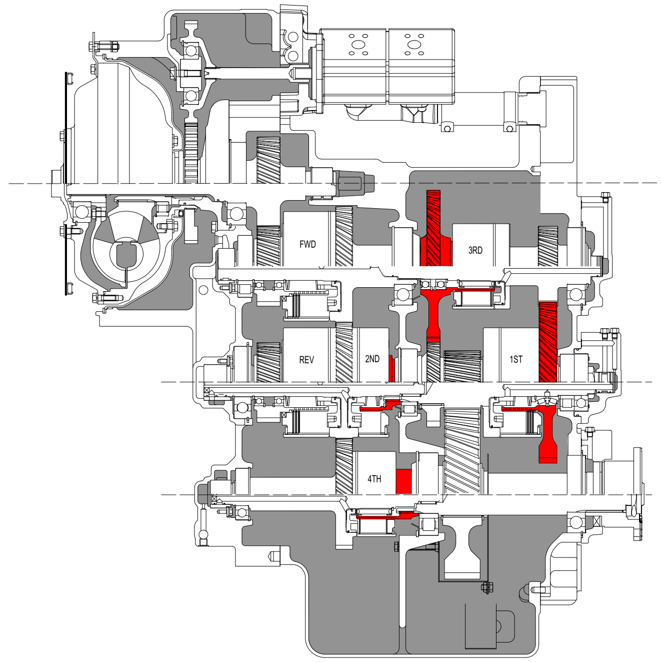
(The engagement of all range and directional clutches is modulated and electronically controlled.). This means that clutch pressure is built up gradually. This will enable the unit to make forward, reverse shifts while the vehicle is still moving and will allow smooth engagement of drive.



INPUT SECTION

6.1.3 The range clutches

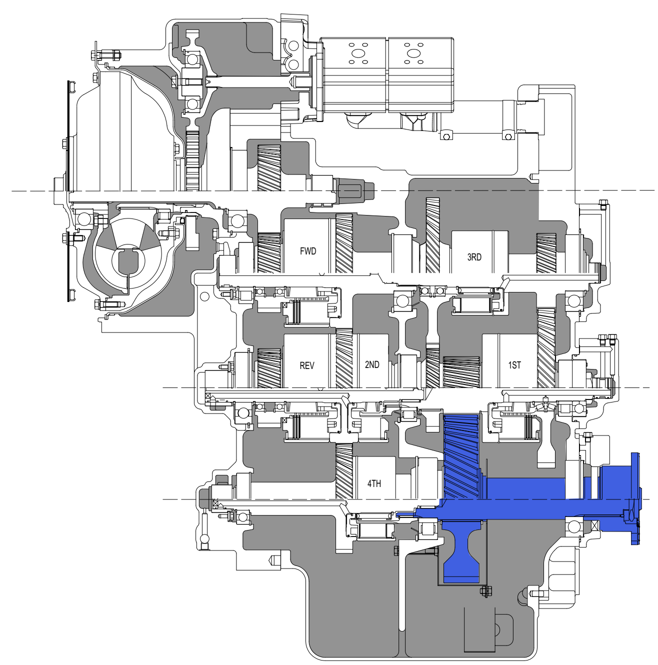
Once a directional clutch is engaged power is transmitted to the range clutches.
Operation and actuation of the directional clutches is similar to the range clutches.
The engagement of the directional clutches is modulated.



RANGE CLUTCHES

6.1.4 The output section

With a range clutch engaged, power is finally transmitted to the output shaft.
Output rotation is the opposite to input rotation when the forward clutch is engaged.



OUTPUT SECTION

6.2 THE TRANSMISSION CONTROLS (REFER TO HYDRAULIC DIAGRAM)

The transmission is controlled by an APC200 box. This unit has a microprocessor that receives certain inputs (gear selector position, speed senors,...), which are processed and will give output signals to the control valve.

Operation of the valve

Regulated pressure 22 bar [319 PSI] is directed to the total neutral shift spool and the pressure reducer that will decrease the pressure to 10 bar [145 psi].
This reduced pressure will be used to supply the electronic controlled modulation valves, total neutral solenoid, 3rd/1st solenoid and 4th/2nd solenoid.

When activated the electronic controlled modulation valves will give an output pressure curve from 0 to 6 bar [0-87PSI]. The pressure intensifiers will multiply this pressure curve so that a curve from 0 to 20 bar [290 PSI] is available for each directional and range clutches. Between each electronic controlled modulation valve and pressure intensifier is placed an accumulator to dampen any hydraulic vibration.

In neutral position, the total neutral solenoid is not activated and no pressure is supplied to the pressure intensifiers. Total neutral solenoid will be activated only when forward or reverse direction is requested.

When forward is selected, total neutral solenoid and forward electronic modulation valve are activated. The forward clutch is fed with modulated pressure supplied through the forward pressure intensifier.

When reverse is selected, total neutral solenoid and reverse electronic modulation valve are activated. The reverse clutch is fed with modulated pressure supplied through the reverse pressure intensifier.

Range selection

3rd and 4th clutch are fed with modulated pressure supplied through their respective pressure intensifiers and electronic controlled modulation valves.
1st clutch is selected when 1st/3rd electronic controlled modulation valve and 1st/3rd solenoid are activated.
The pilot pressure of the 1st/3rd solenoid will move the shift spool so that 1st clutch can be fed with modulated pressure.
2nd clutch is selected when 4th/2nd electronic controlled modulation valve and 4th/2nd solenoid are activated.
The pilot pressure of the 4th/2nd solenoid will move the shift spool so that 2st clutch can be fed with modulated pressure.

Pressure switch

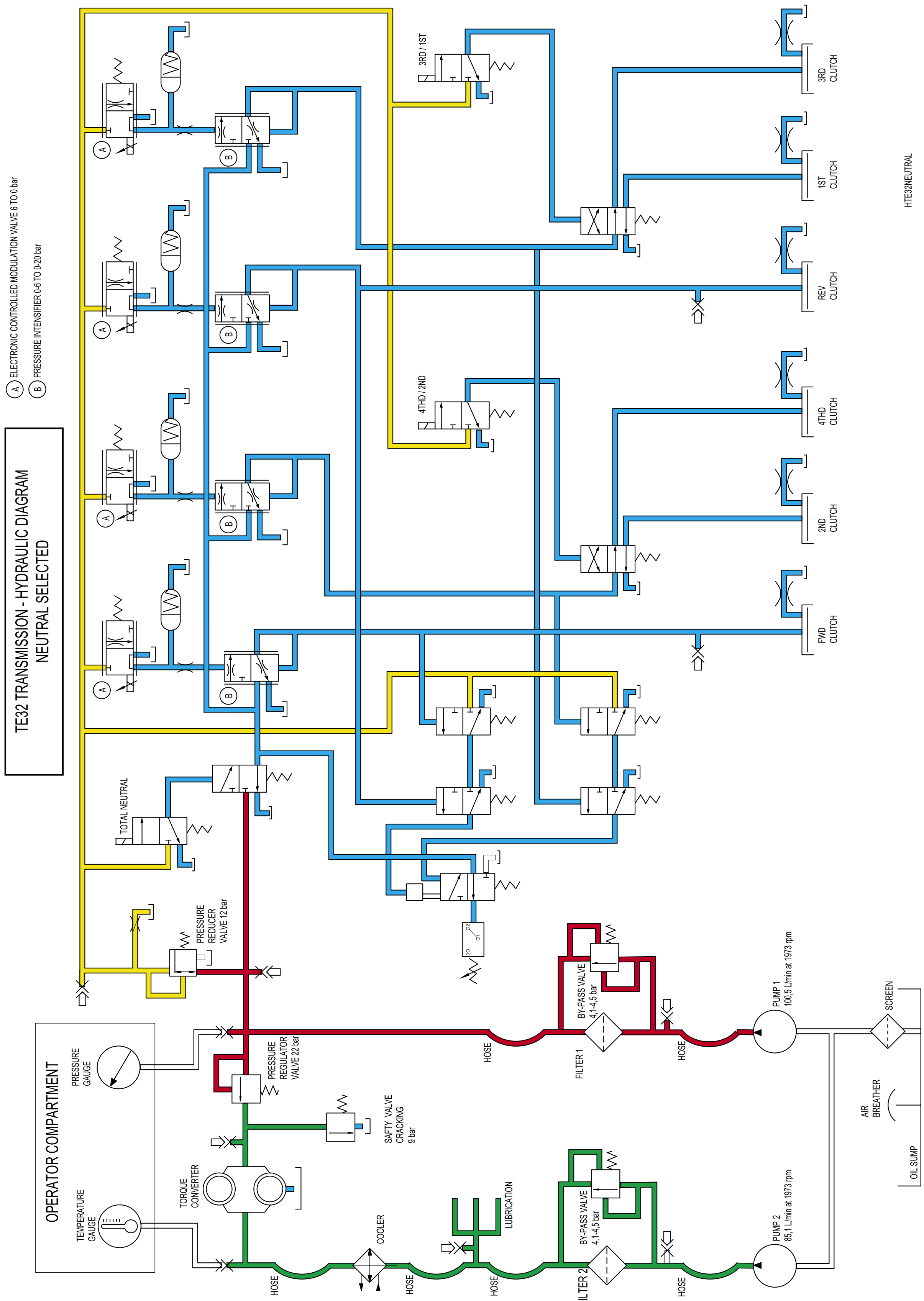
The control valve also has a pressure switch installed between the total neutral shift spool and the pressure intensifiers supply. This switch will verify that pressure to the various pressure intensifiers is supplied only when the total neutral solenoid is activated. This information is an input of the APC200 box.

6.3 ELECTRIC SOLENOID CONTROLS

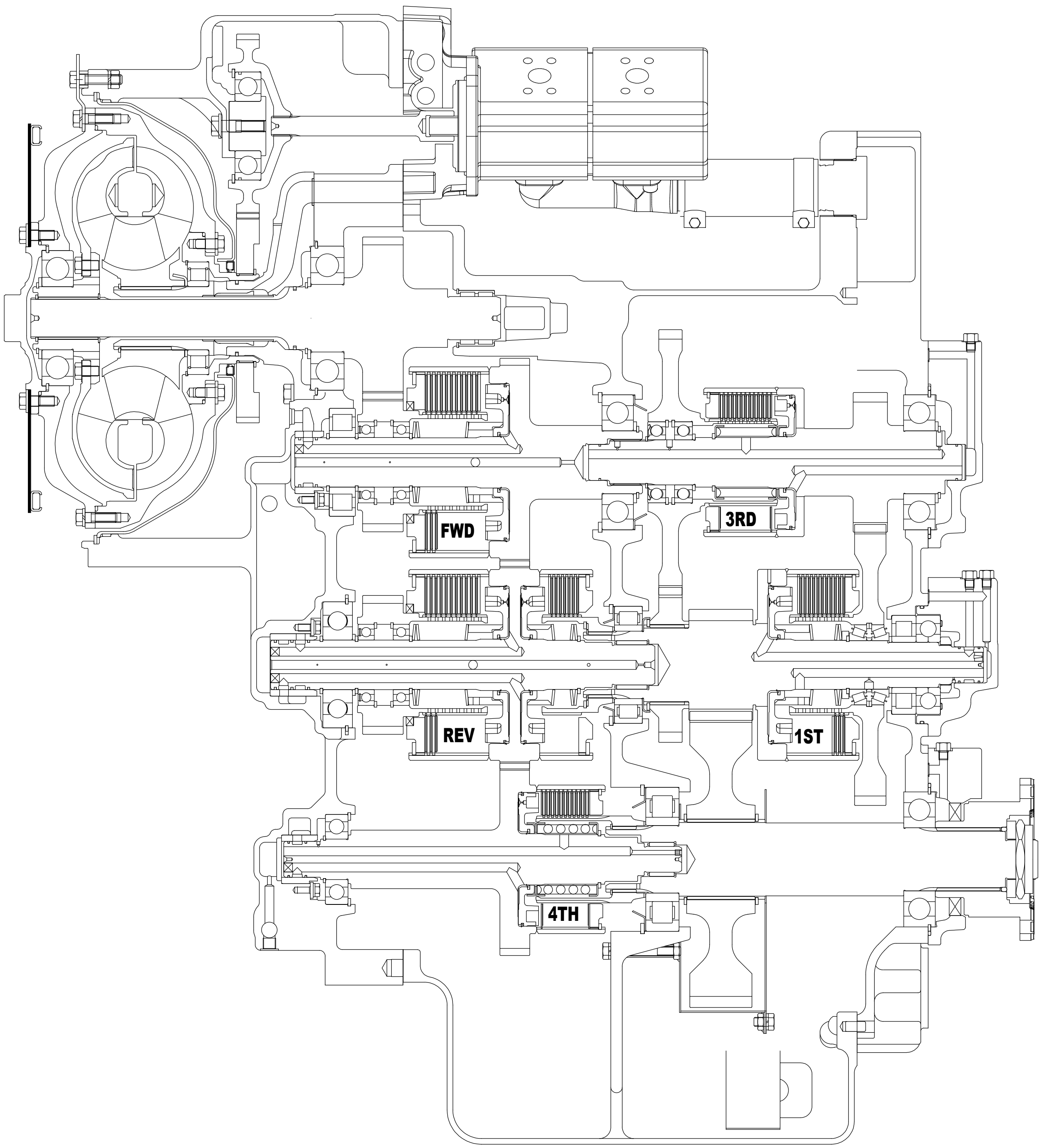
Transmission gear	Activated solenoids	Activated clutches
Forward 4	N,FWD, 2nd/4th	Forward, 4th
Forward 3	N, FWD, 1st/3rd	Forward, 3rd
Forward 2	N, FWD, 2nd/4th, 2nd/4th range	Forward, 2nd
Forward 1	N, FWD, 1st/3rd, 1st/3rd range	Forward, 1st
Neutral		
Reverse 3	N, REV, 1st/3rd	Reverse, 3rd
Reverse 2	N, REV, 2nd/4th, 2nd/4th range	Reverse, 2nd
Reverse 1	N, REV, 1st/3rd, 1st/3rd range	Reverse, 1st

6.4 POWERFLOWS, ACTIVATED SOLENOIDS AND HYDRAULIC CIRCUIT

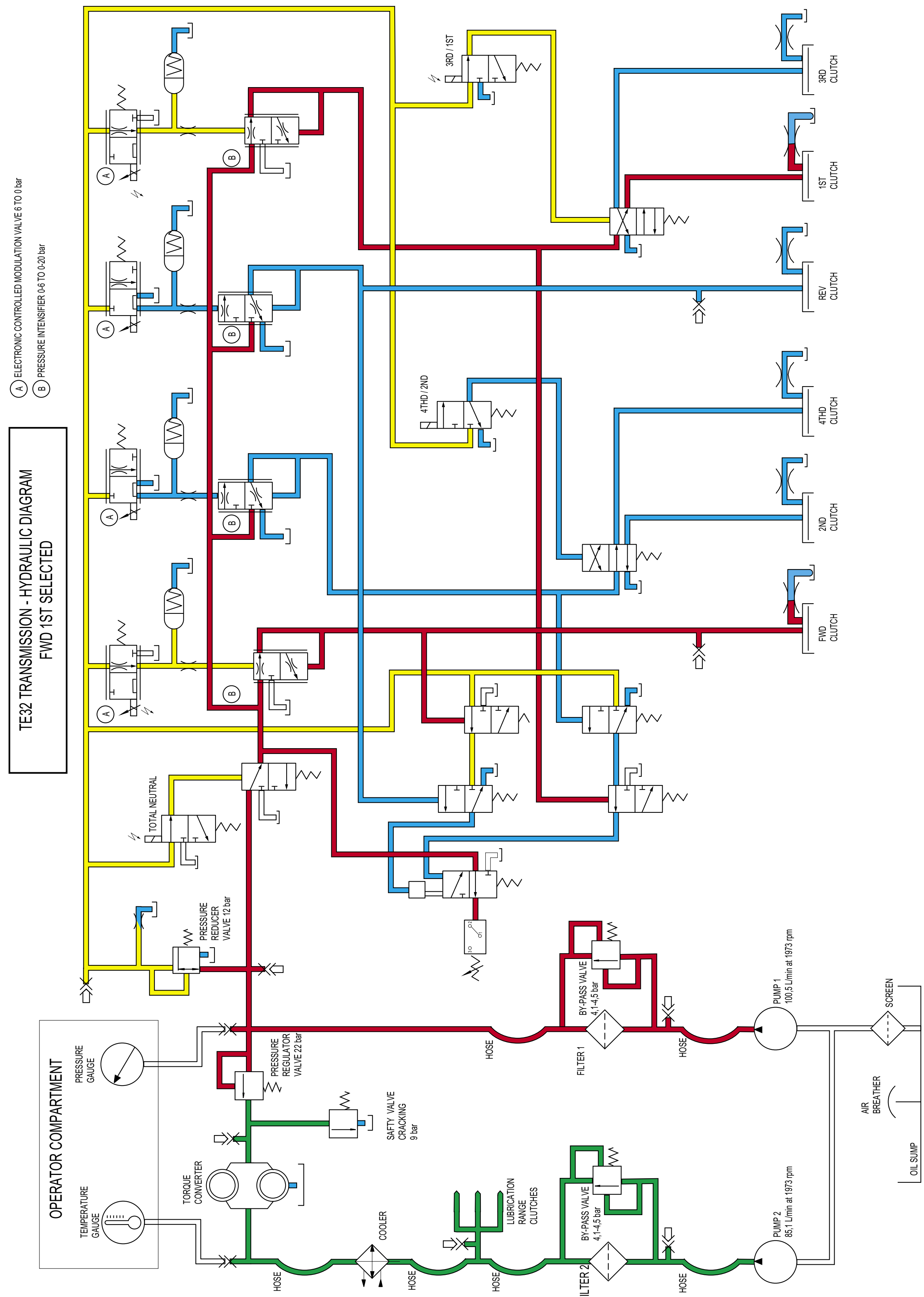
6.4.1 Neutral Selected



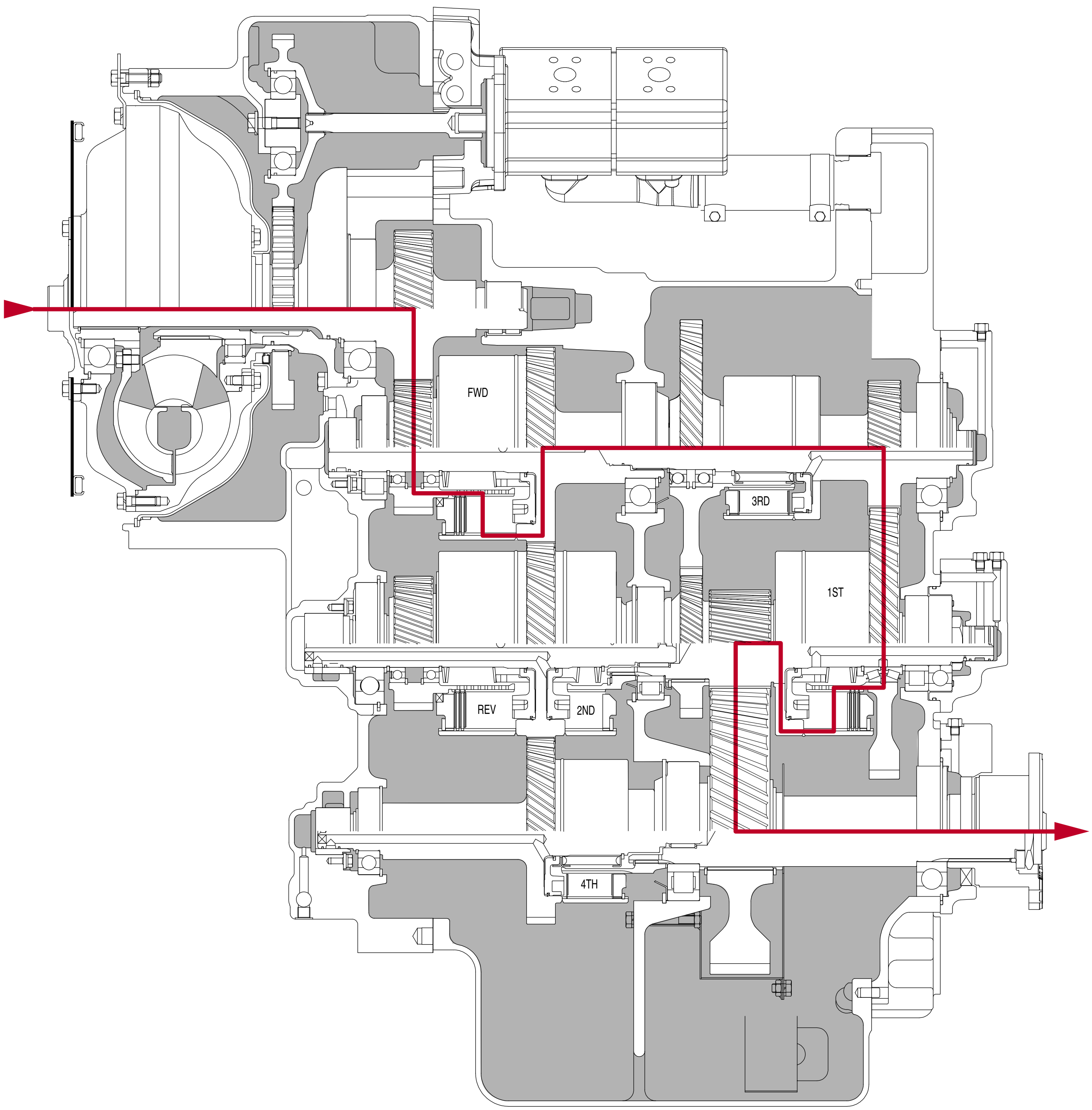
6.4.1 Neutral (Continued)



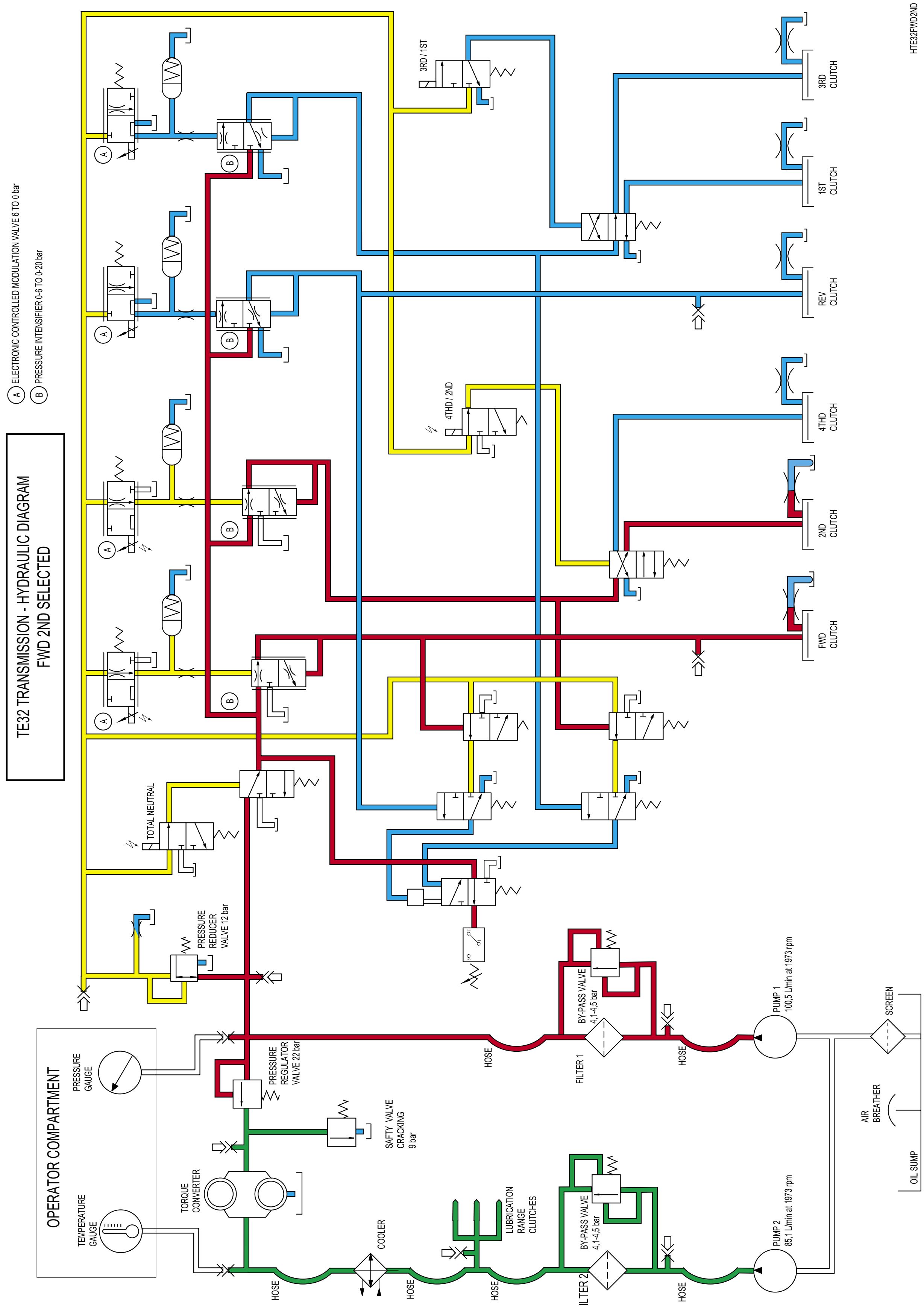
6.4.2 Forward 1st speed



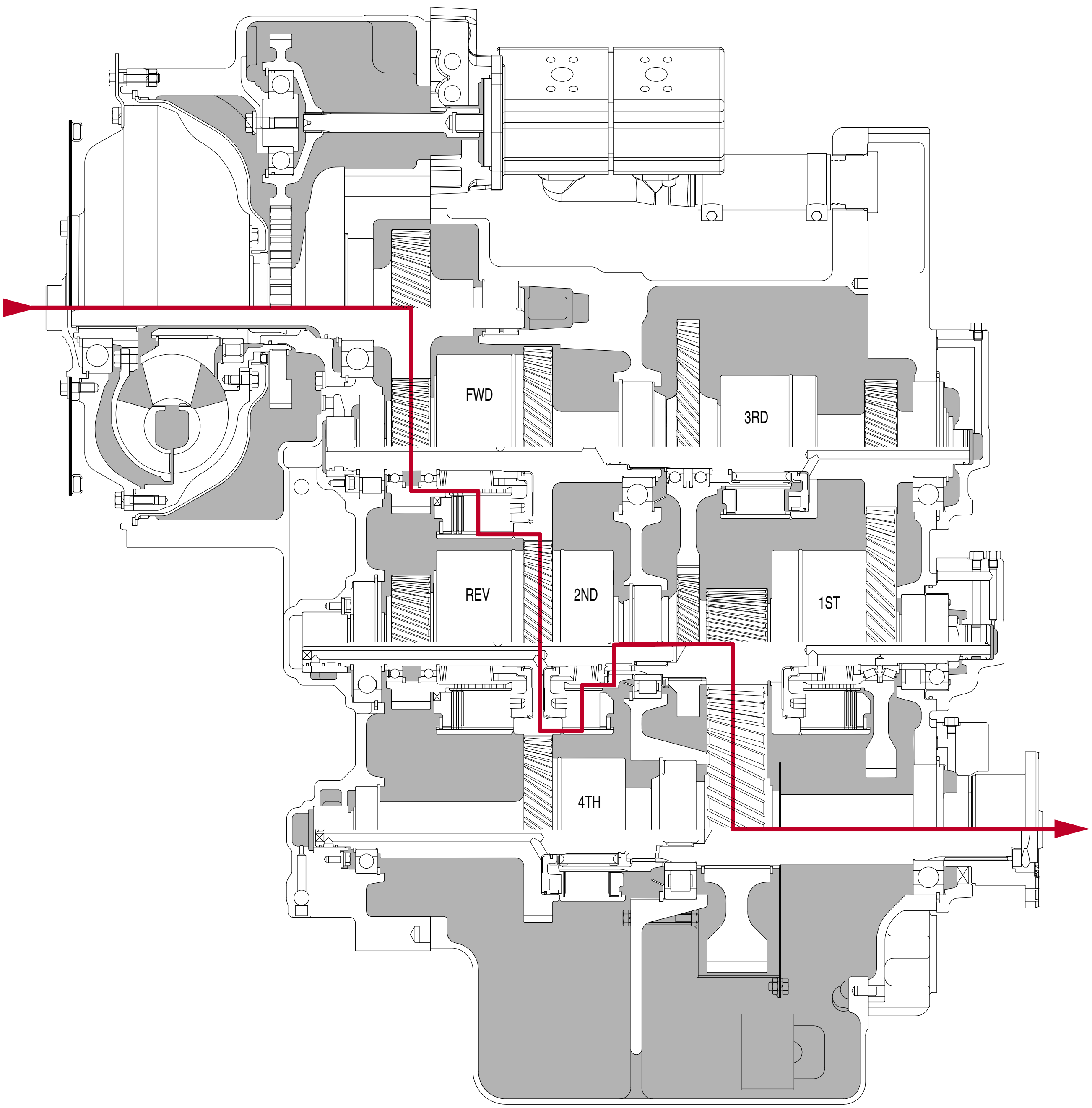
6.4.2 Forward 1st speed (continued)



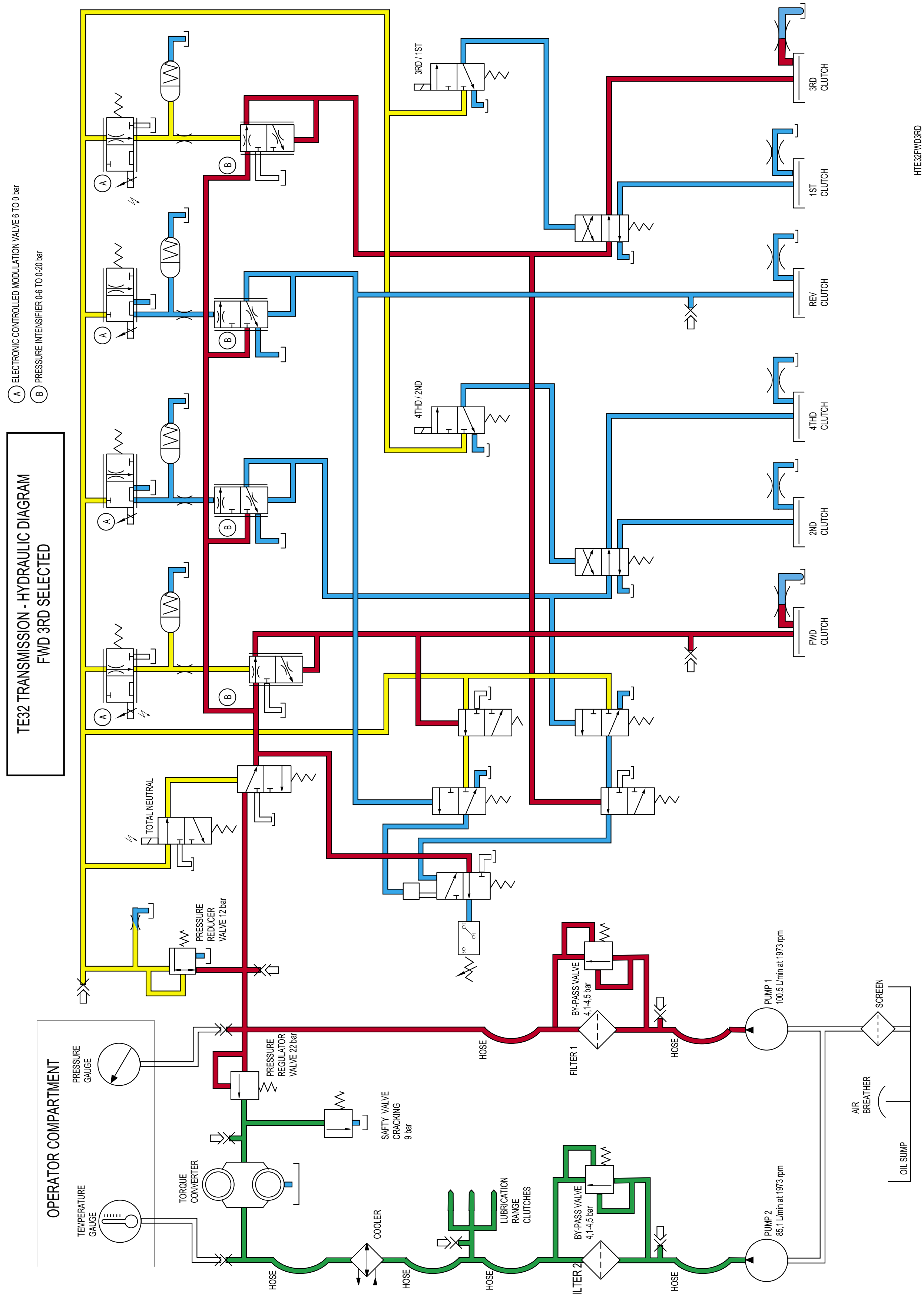
6.4.3 Forward 2nd speed



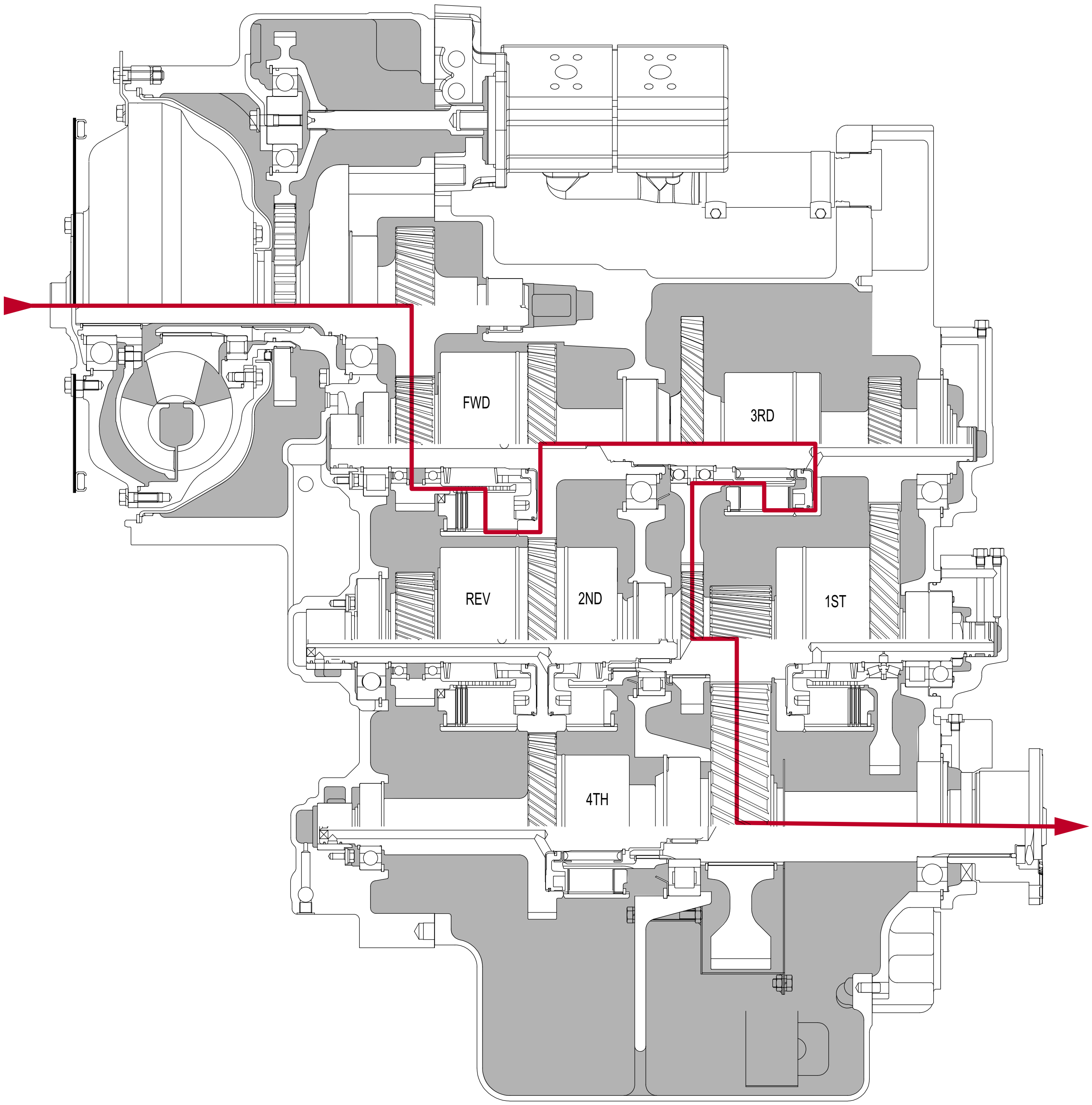
6.4.3 Forward 2nd speed (continued)



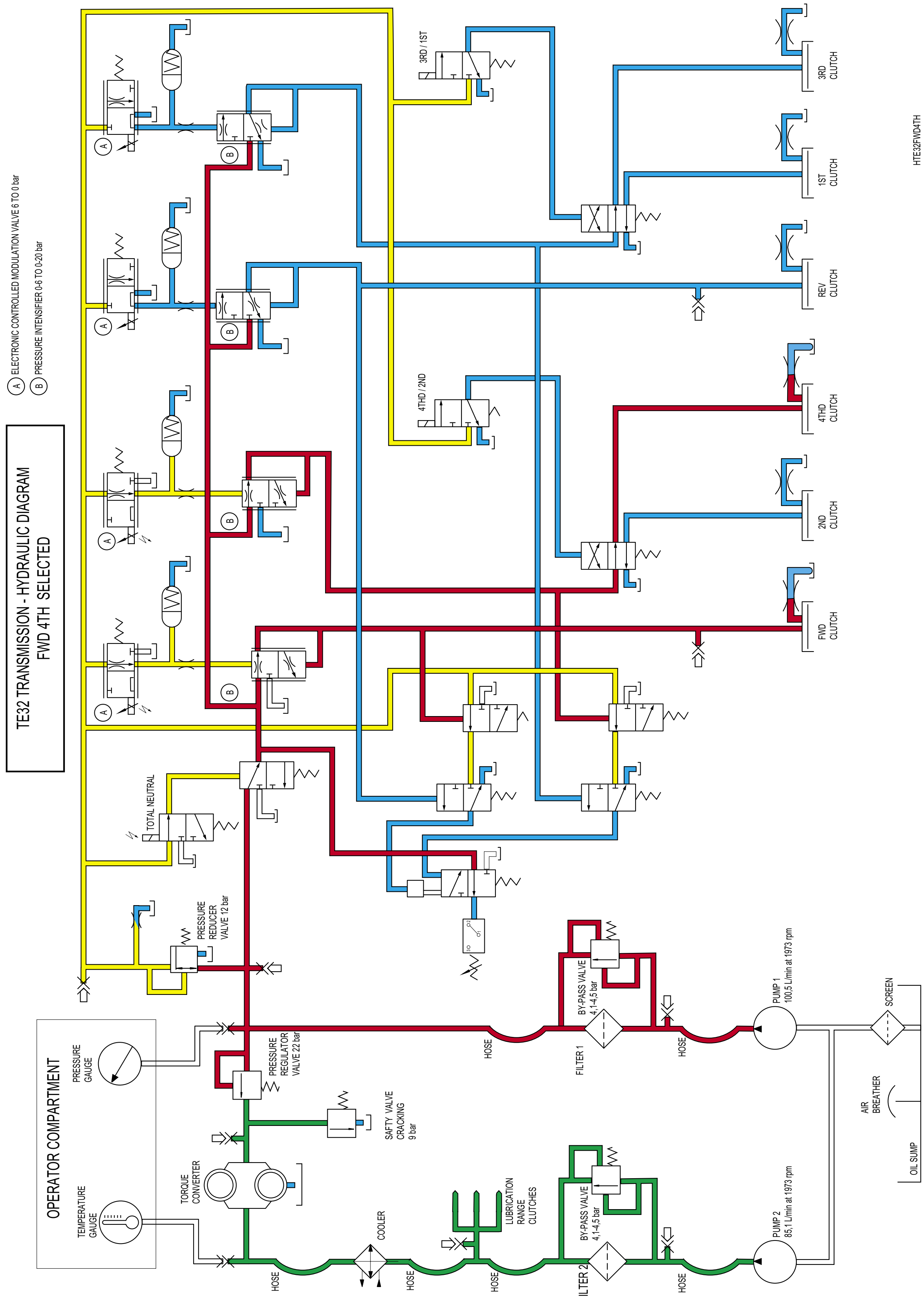
6.4.4 Forward 3rd speed



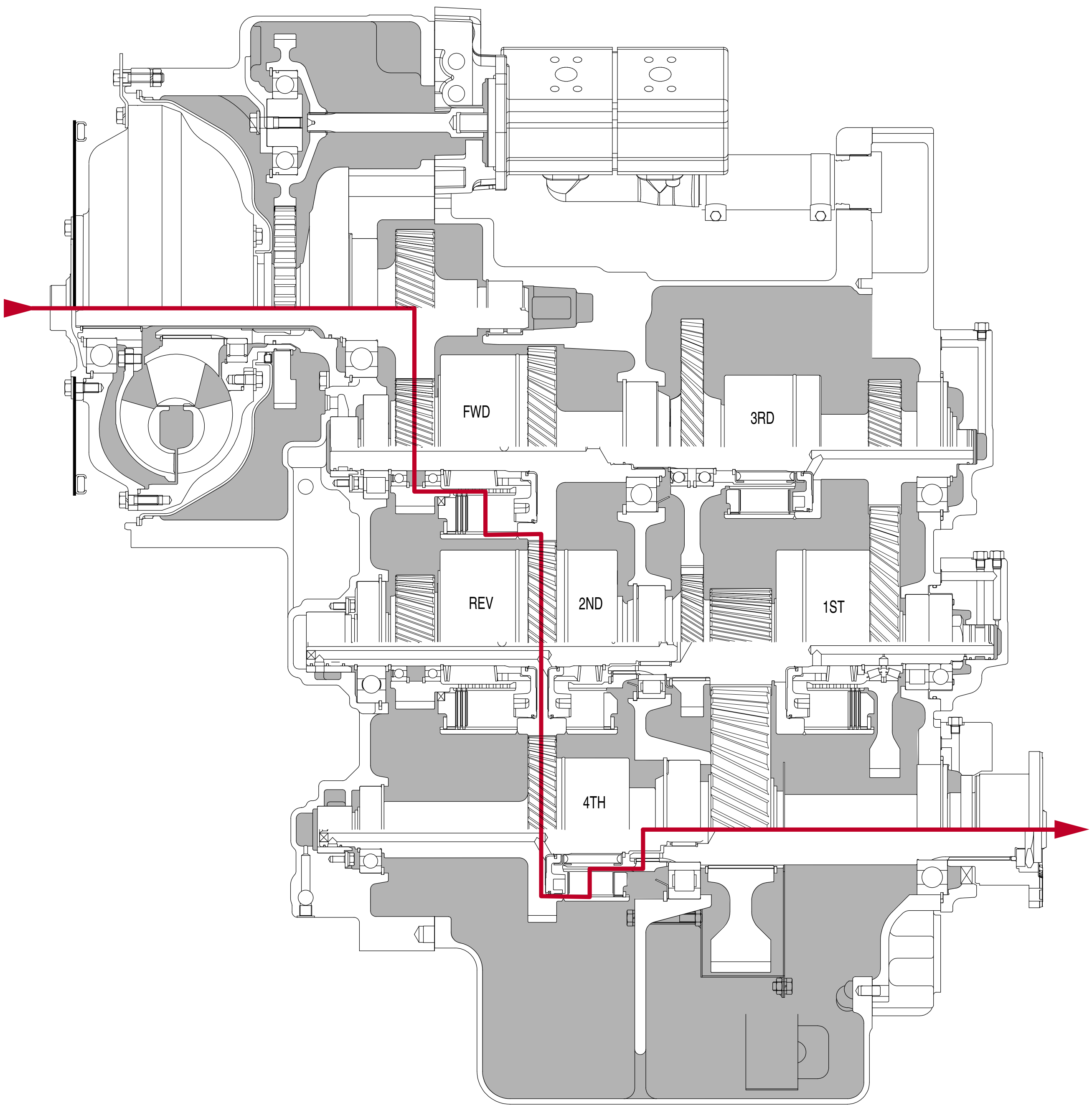
6.4.4 Forward 3rd speed (continued)



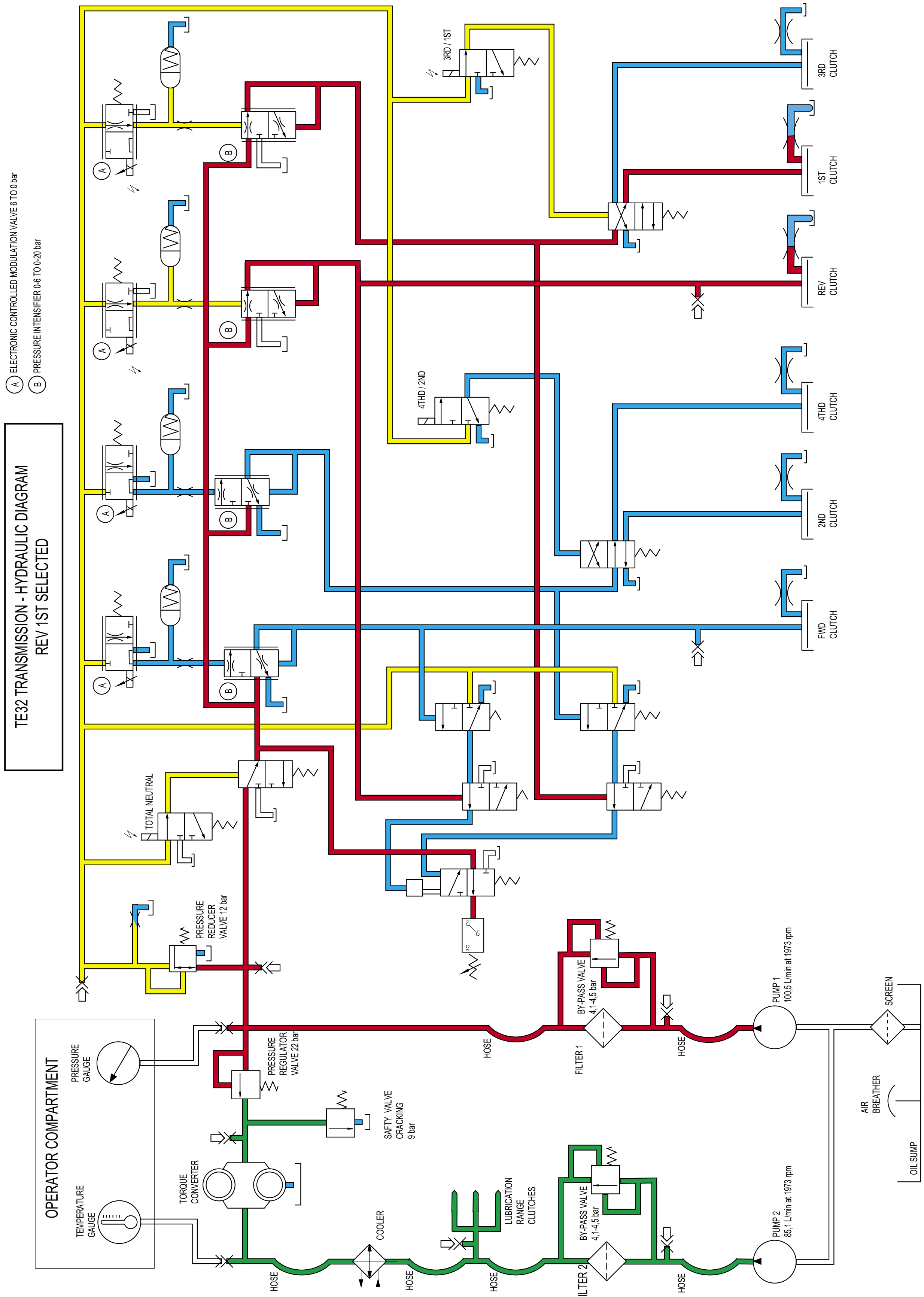
6.4.5 Forward 4th speed



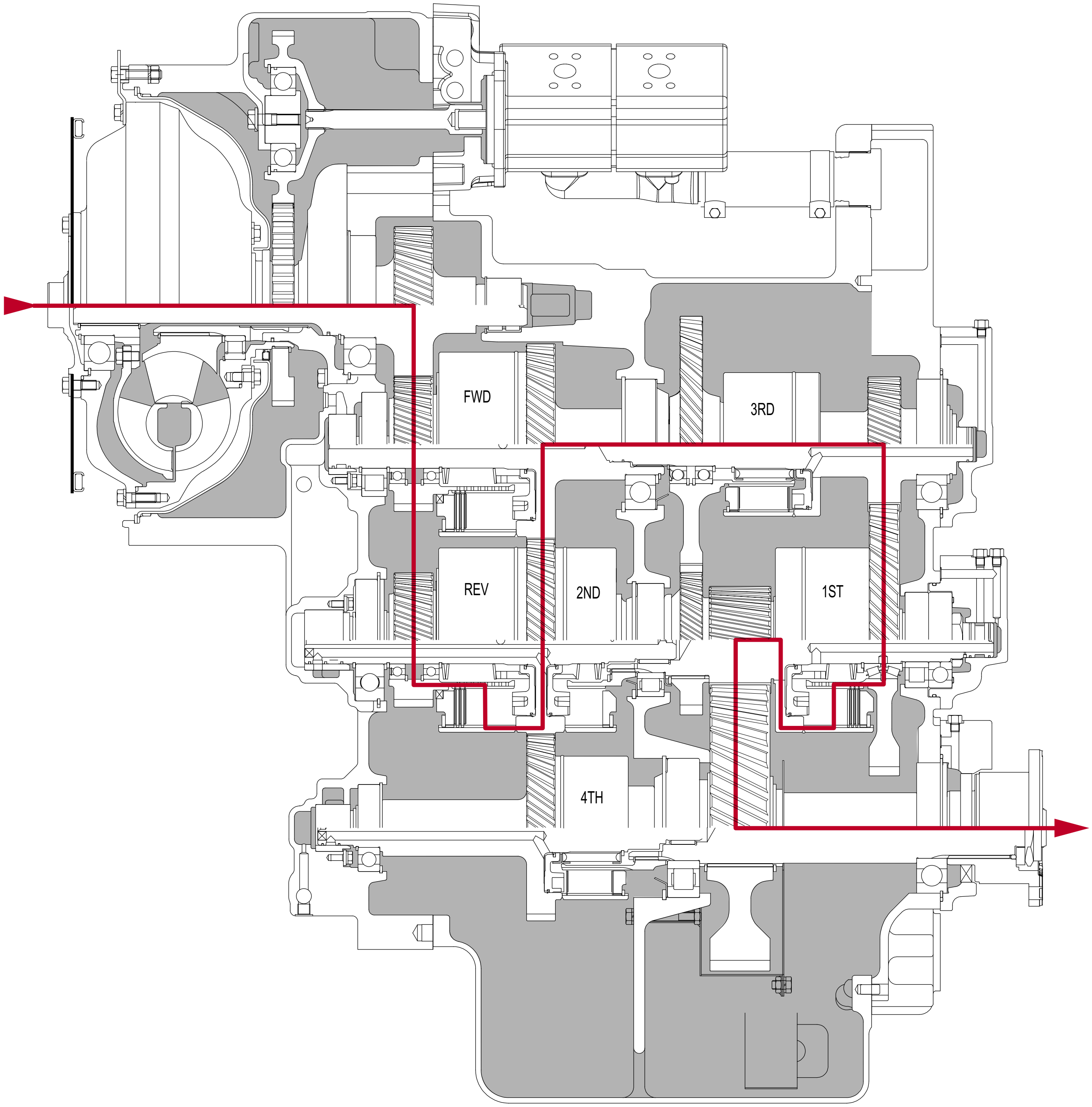
6.4.5 Forward 4th speed (continued)



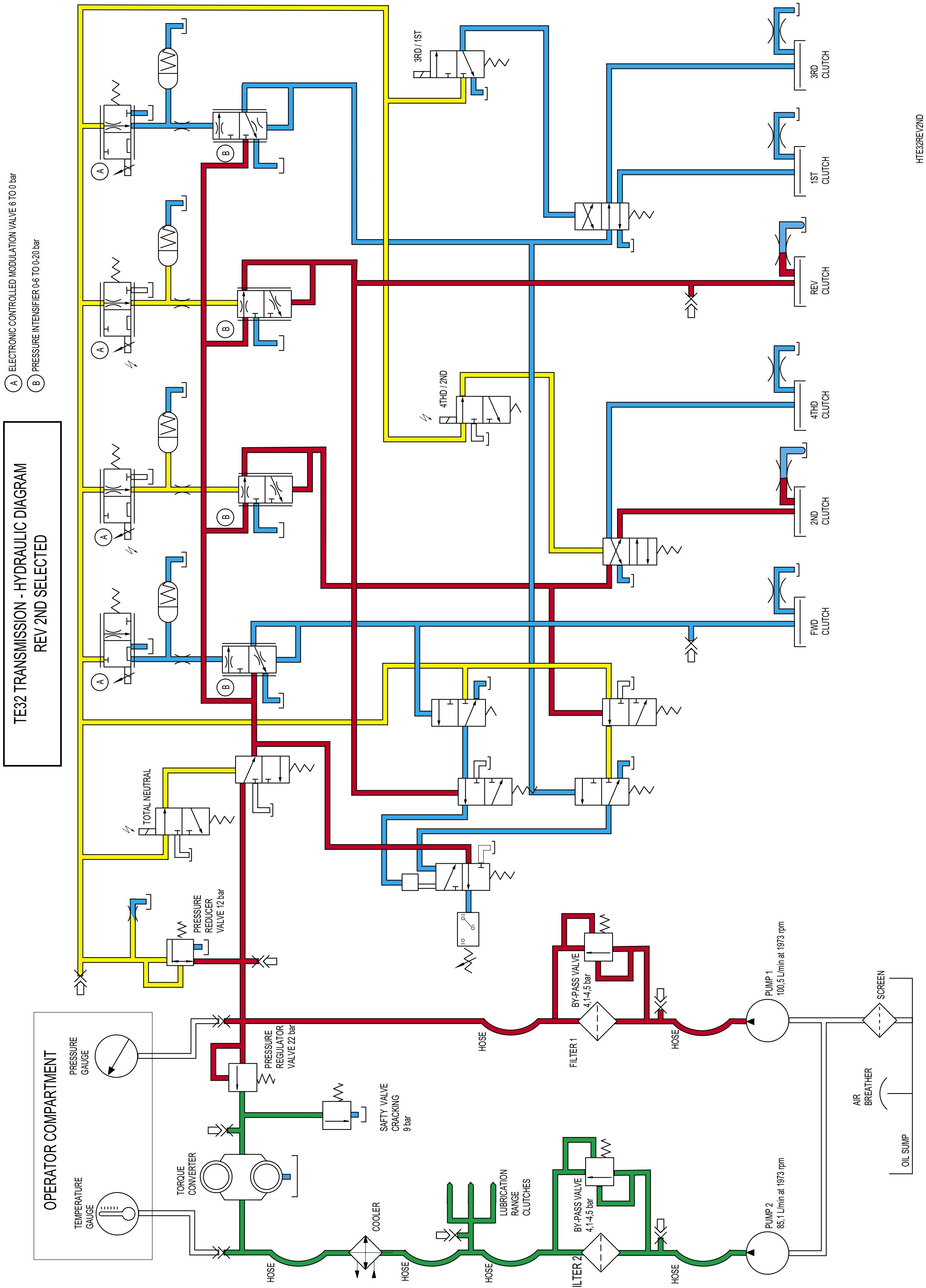
6.4.6 Reverse 1st speed



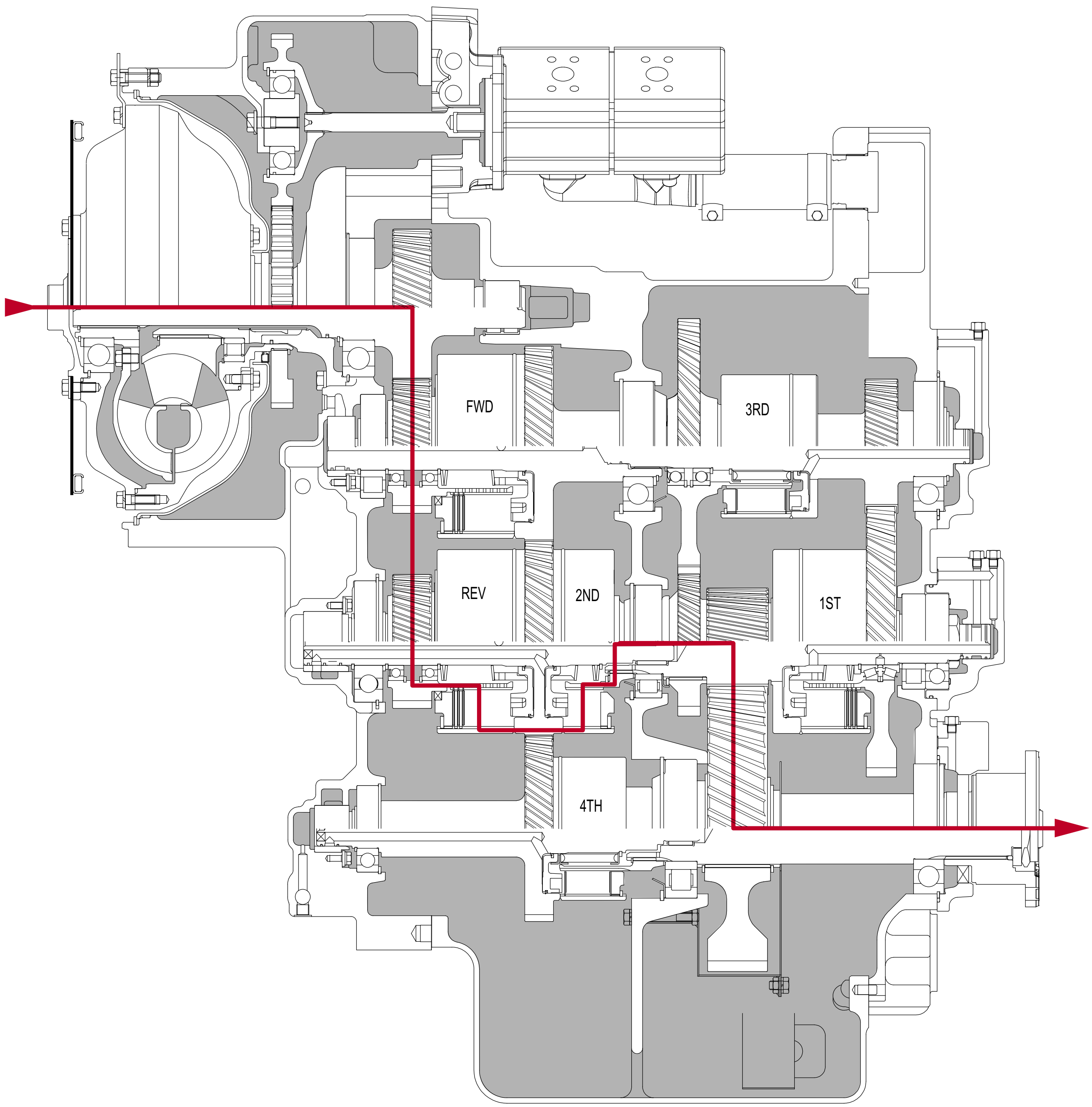
6.4.6 Reverse 1st speed (continued)



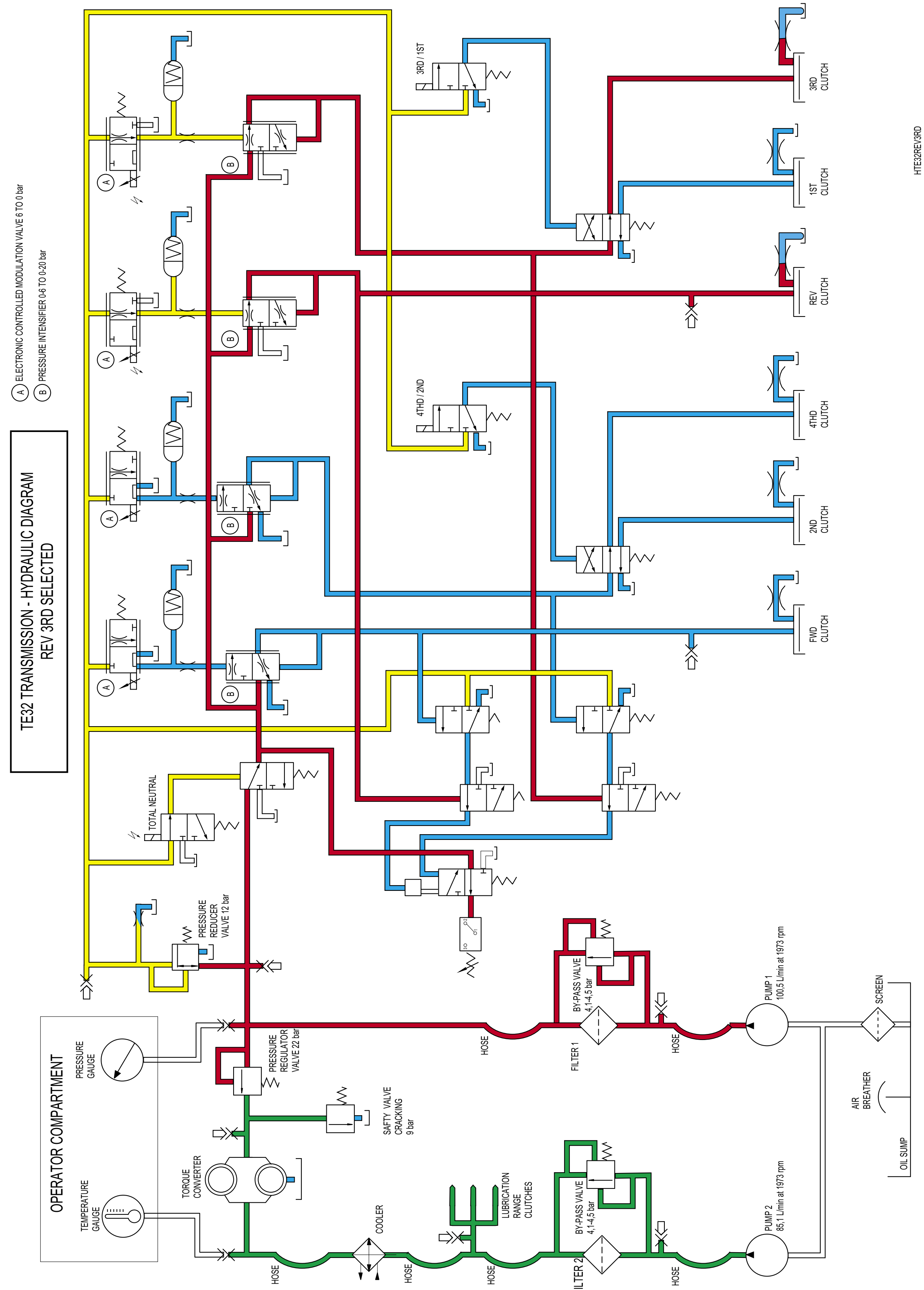
6.4.7 Reverse 2nd speed



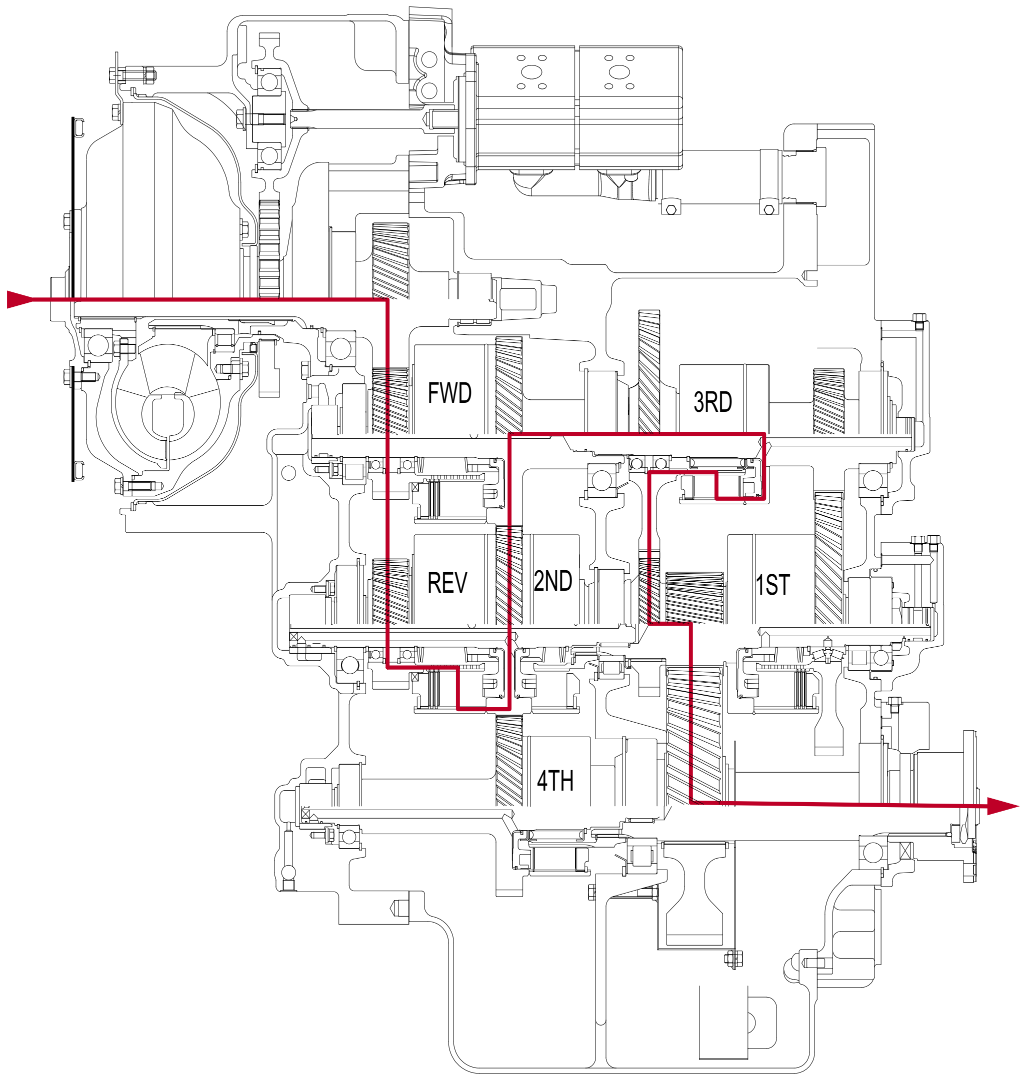
6.4.7 Reverse 2nd speed (continued)



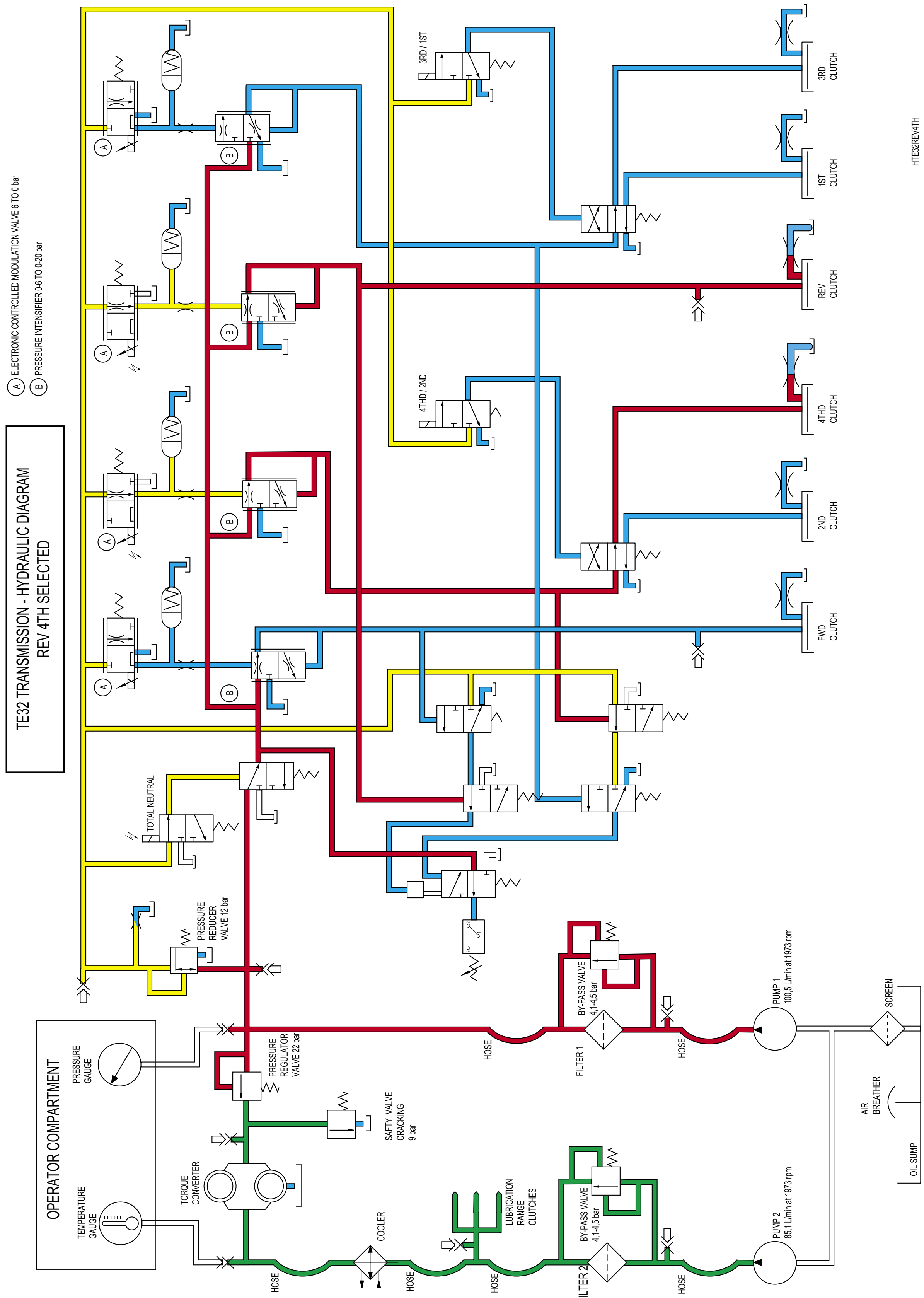
6.4.8 Reverse 3rd speed



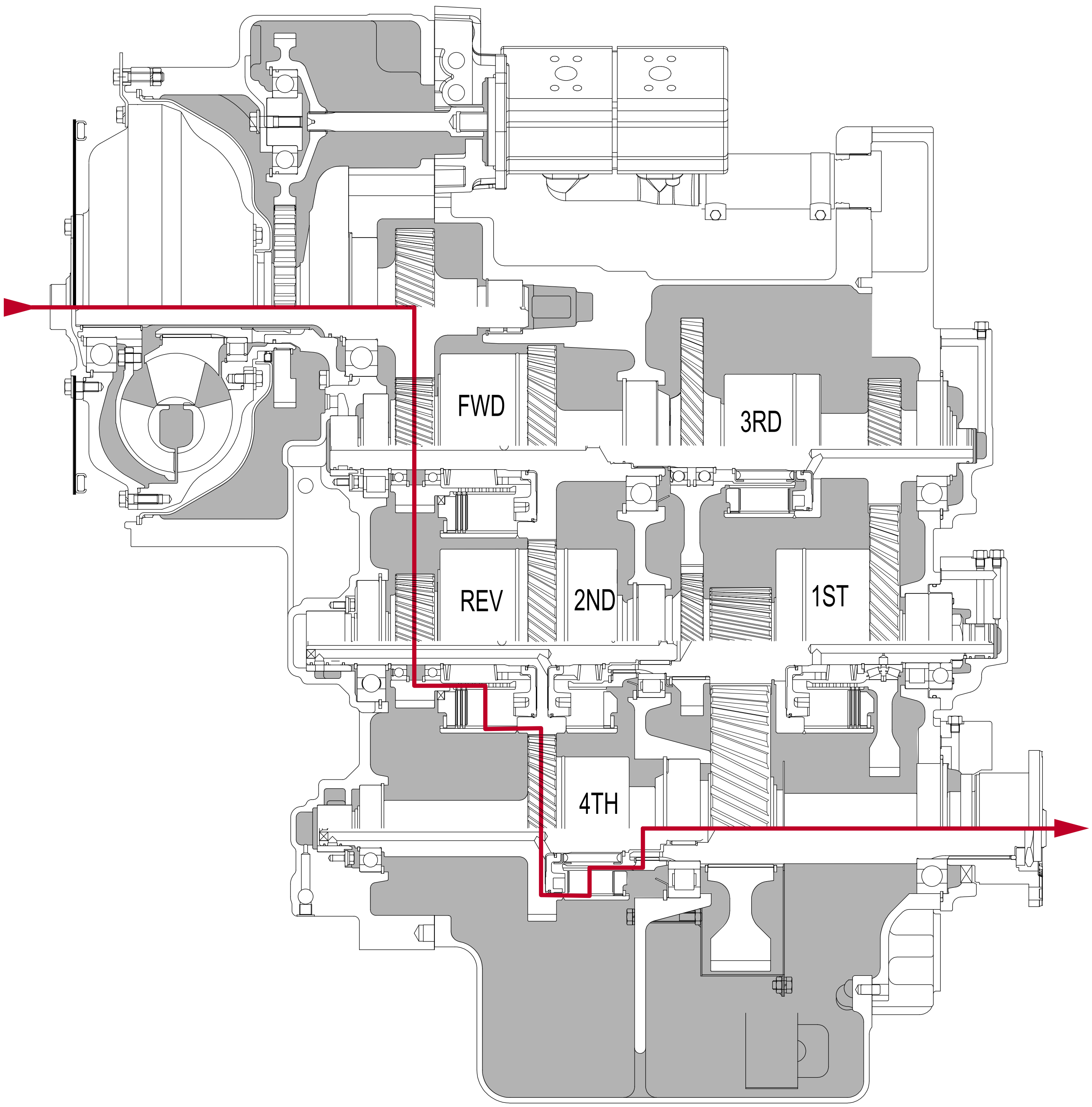
6.4.8 Reverse 3rd speed (continued)



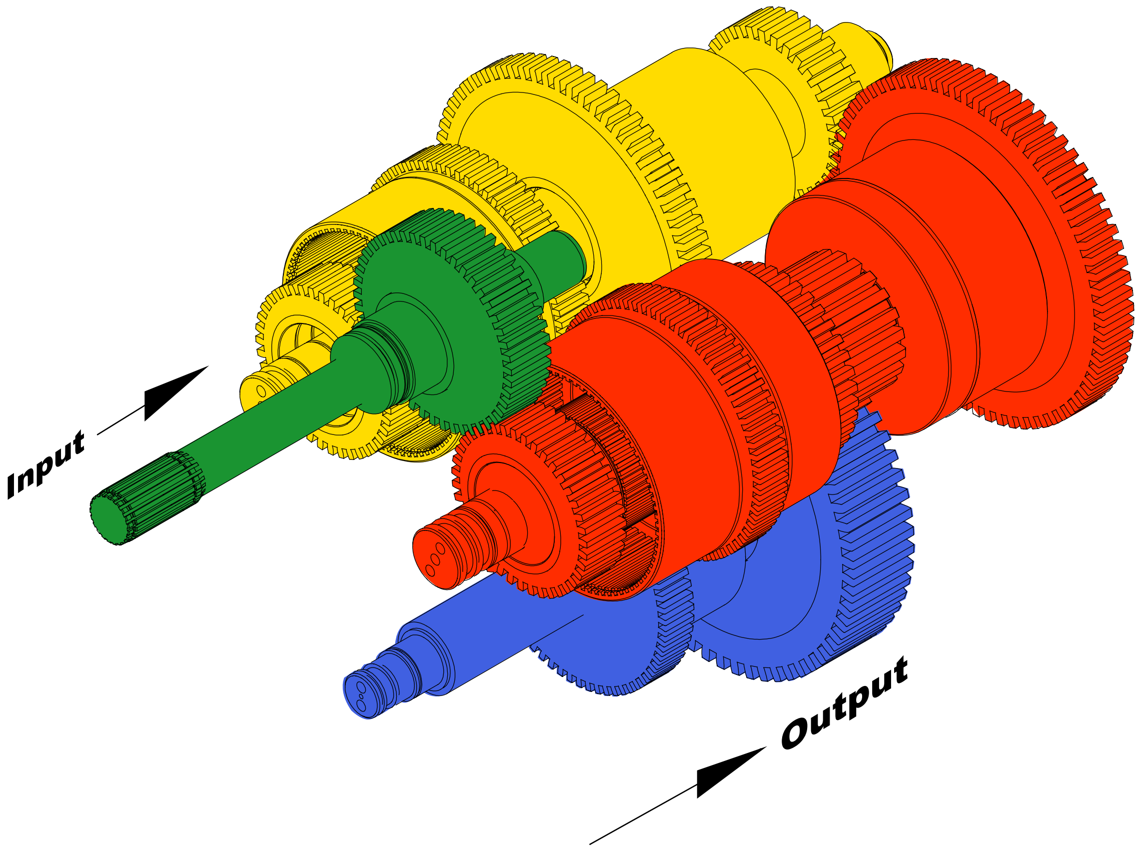
6.4.9 Reverse 4th speed



6.4.9 Reverse 4th speed (continued)



6.5 GEAR AND CLUTCH LAY-OUT



7 TROUBLESHOOTING GUIDE

The following information is presented as an aid to isolate and determine the specific problem area in a transmission that is not functioning correctly.

When troubleshooting a “transmission” problem, it should be kept in mind that the transmission is only the central unit of a group of related powertrain components. Proper operation of the transmission depends on the condition and correct functioning of the other components of the group.

Therfore, to properly diagnose a suspected problem in the transmission, it is necessary to consider the transmission fluid, charging pump, torque converter, transmission assembly, oil cooler, filter, connecting lines and controls, including the engine as a complete system.

By analysing the principles of operation together with the information in this section, it should be possible to identify and correct any malfunction which may occur in the system.

7.1 THE TRANSMISSION

TE27/32 powershift transmission with torque converter troubles fall into four general categories:

1. Mechanical problems
2. Hydraulical problems
3. Electrical problems
4. Controller problems

In addition to the mechanical and electrical components, all of which must be in proper condition and functioning correctly, the correct functioning of the hydraulic circuit is most important. Transmission fluid is the “life blood” of the transmission. It must be supplied in an adequate quantity and delivered to the system at the correct pressures to ensure converter operation, to engage and hold the clutches from slipping, and to cool and lubricate the working components.

7.2 THE INPUT SHAFT AND DIRECTIONAL CLUTCHES

7.2.1 Stall test

A stall test identifies transmission, converter or engine problems.

Use the following procedure:

1. Put the vehicle against a solid barrier, such as a wall and/or apply the parking brake, block the wheels.
2. Put the directional control lever in FORWARD (or REVERSE, as applicable).
3. Select the highest speed.

With the engine running, slowly increase engine speed to approximately one-half throttle and hold until transmission (converter outlet) oil temperature reaches the operating range. 70°C [158° F]

4. Once the oil temperature reaches 70° C [158° F] check max. stall speed at full throttle in all gears. The figure obtained should be within 50 RPM as mentioned in the vehicle handbook and should be equal in all gears. Between gears allow the converter outlet temperature to cool down. to 70° C [158° F] by selecting neutral.

If max. stall speed measured is below specifications, it could indicate an engine or converter problem.
If max. stall speed measured is above specifications, it could indicate slipping clutches.

CAUTION

DO NOT OPERATE THE CONVERTER AT STALL CONDITION LONGER THAN 30 SECONDS AT ONE TIME, SHIFT TO NEUTRAL FOR 15 SECONDS AND REPEAT THE PROCEDURE UNTIL DESIRED TEMPERATURE IS REACHED.

EXCESSIVE TEMPERATURE 120° C [250° F] MAXIMUM WILL CAUSE DAMAGE TO TRANSMISSION CLUTCHES, FLUID, CONVERTER AND SEALS.

7.2.2 Transmission pressure checks

TRANSMISSION PROBLEMS CAN BE ISOLATED BY THE USE OF PRESSURE TESTS. WHEN THE STALL TEST INDICATES SLIPPING CLUTCHES, THEN MEASURE CLUTCH PACK PRESSURE TO DETERMINE IF THE SLIPPAGE IS DUE TO LOW PRESSURE OR CLUTCH PLATE FRICTION MATERIAL FAILURE.

IN ADDITION, CONVERTER CHARGING PRESSURE AND TRANSMISSION LUBRICATION PRESSURE CAN ALSO BE MEASURED.

7.2.3 Mechanical and electrical checks

PRIOR TO CHECKING ANY PART OF THE SYSTEM FOR HYDRAULIC FUNCTION (PRESSURE TESTING), THE FOLLOWING MECHANICAL AND ELECTRICAL CHECKS SHOULD BE MADE:

• CHECK THE PARKING BRAKE AND INCHING PEDAL FOR CORRECT ADJUSTMENT.• BE SURE ALL LEVER LINKAGE IS PROPERLY CONNECTED AND ADJUSTED IN EACH SEGMENT AND AT ALL CONNECTING POINTS.

• THE CONTROLS ARE ACTUATED ELECTRICALLY. CHECK THE WIRING AND ELECTRICAL COMPONENTS.

• BE SURE THAT ALL COMPONENTS OF THE COOLING SYSTEM ARE IN GOOD CONDITION AND OPERATING CORRECTLY. THE RADIATOR MUST BE CLEAN TO MAINTAIN PROPER COOLING AND OPERATING TEMPERATURES FOR THE ENGINE AND TRANSMISSION. AIR CLEAN THE RADIATOR, IF NECESSARY.

7.2.4 Hydraulic checks

ALSO, BEFORE CHECKING THE TRANSMISSION CLUTCHES, TORQUE CONVERTER, CHARGING PUMP AND HYDRAULIC CIRCUIT FOR PRESSURE AND RATE OF FLOW, IT IS IMPORATANT TO MAKE THE FOLLOWING TRANSMISSION FLUID CHECK:

• CHECK OIL LEVEL IN THE TRANSMISSION. THE TRANSMISSION FLUID MUST BE AT THE CORRECT (FULL LEVEL).

• ALL CLUTCHES AND THE CONVERTER AND ITS FLUID CIRCUIT LINES MUST BE FULLY CHARGED (FILLED) AT ALL TIMES.

NOTE:

THE TRANSMISSION FLUID MUST BE AT OPERATING TEMPERATURE OF 82 - 93° C [180 - 200° F] TO OBTAIN CORRECT FLUID LEVEL AND PRESSURE READINGS.

DO NOT ATTEMPT TO MAKE THESE CHECKS WITH COLD OIL.

TO RAISE THE OIL TEMPERATURE TO THIS SPECIFICATION IT IS NECESSARY TO EITHER OPERATE (WORK) THE VEHICLE OR RUN THE ENGINE WITH CONVERTER AT "STALL" (REFER TO 6.2.1 "STALL TEST").

CAUTION:

BE CAREFULL THAT THE VEHICLE DOES NOT MOVE UNEXPECTEDLY WHEN OPERATING THEENGINE AND CONVERTER AT STALL RPM.

7.2.5 Controller (APC200): Please refer to functional description

7.3 TROUBLESHOOTING GUIDE

Refer to the following troubleshooting guide for the diagnosis of typical transmission troubles

7.3.1 Low clutch pressure

Cause	Remedy
1. Low oil level.	1. Fill to proper level.
2. Clutch pressure regulating valve stuck open.	2. Clean valve spool and housing.
3. Faulty charging pump.	3. Replace pump.
4. Broken or worn clutch shaft or piston sealing rings.	4. Replace sealing rings.
5. Clutch piston bleed valve stuck open.	5. Clean bleed valve thoroughly.

7.3.2 Low charging pump output flow

Cause	Remedy
1. Low oil level.	1. Fill to proper oil level.
2. Suction screen clogged.	2. Clean suction screen.
3. Defective charging pump.	3. Replace charging pump.

7.3.3 Overheating

Cause	Remedy
1. Worn oil sealing rings	1. Remove, disassemble and rebuild converter assy.
2. Worn charging pump.	2. Replace charging pump.
3. Low oil level.	3. Fill to proper level.
4. Dirty oil cooler.	4. Clean cooler.
5. Restriction in cooler lines.	5. Change cooler lines.

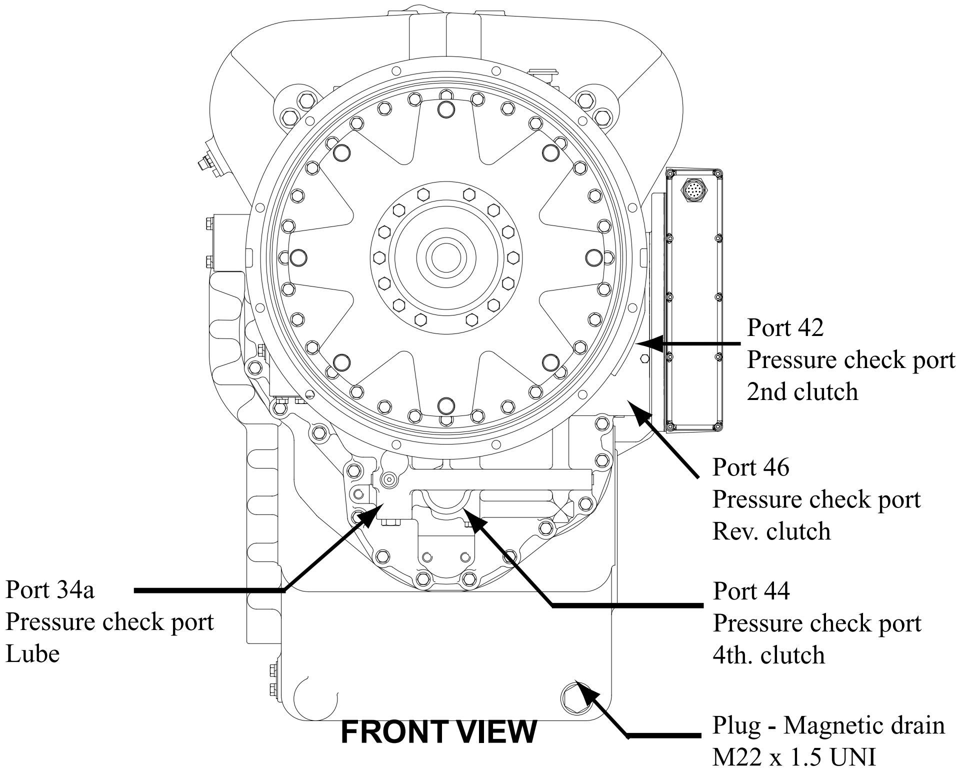
7.3.4 Noisy converter

Cause	Remedy
1. Worn charging pump.	1. Replace charging pump.
2. Worn or damaged bearings.	2. A complete disassembly will be necassary to determine which bearing is faulty.

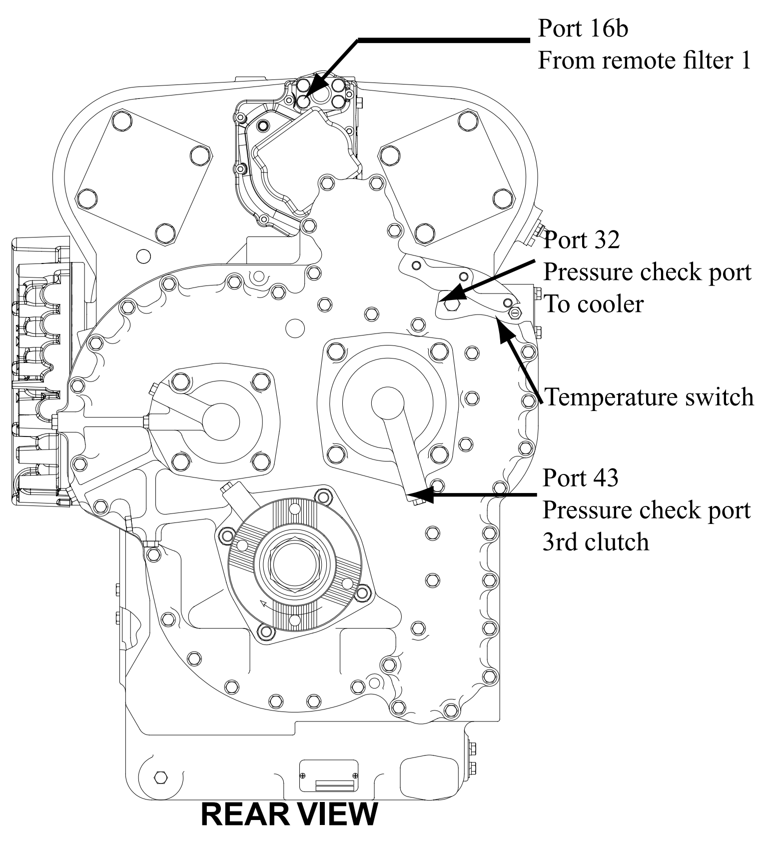
7.3.5 Lack of power

Cause	Remedy
1. Low engine RPM at converter stall.	1. Tune engine, check governor.
2. See “Overheating” and make same checks.	2. Make corrections as explained in “Overheating”.

7.4 CHECK POINTS

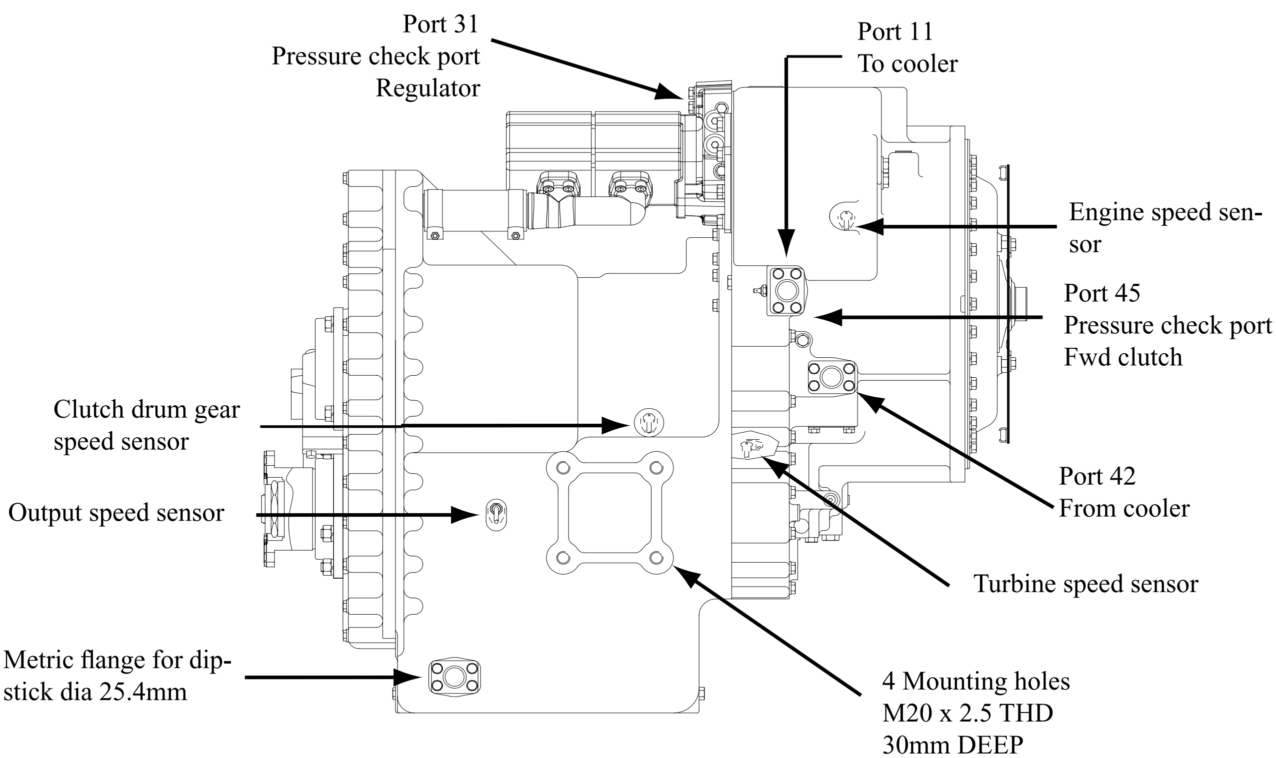


FRONT VIEW

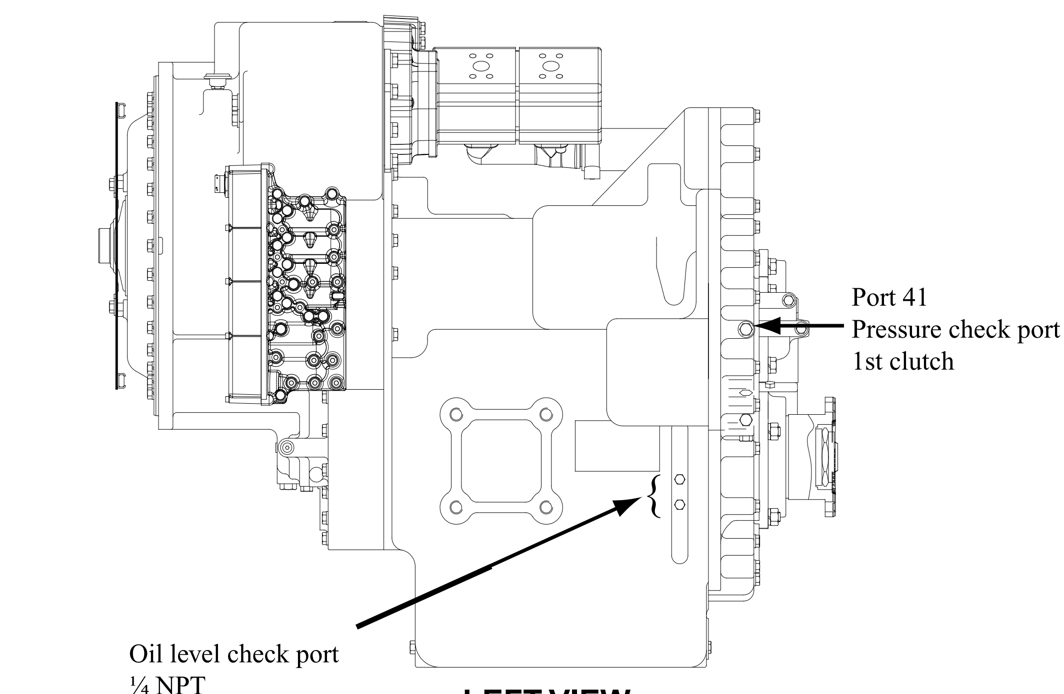


REAR VIEW

7.4 CHECK POINTS (CONTINUED)

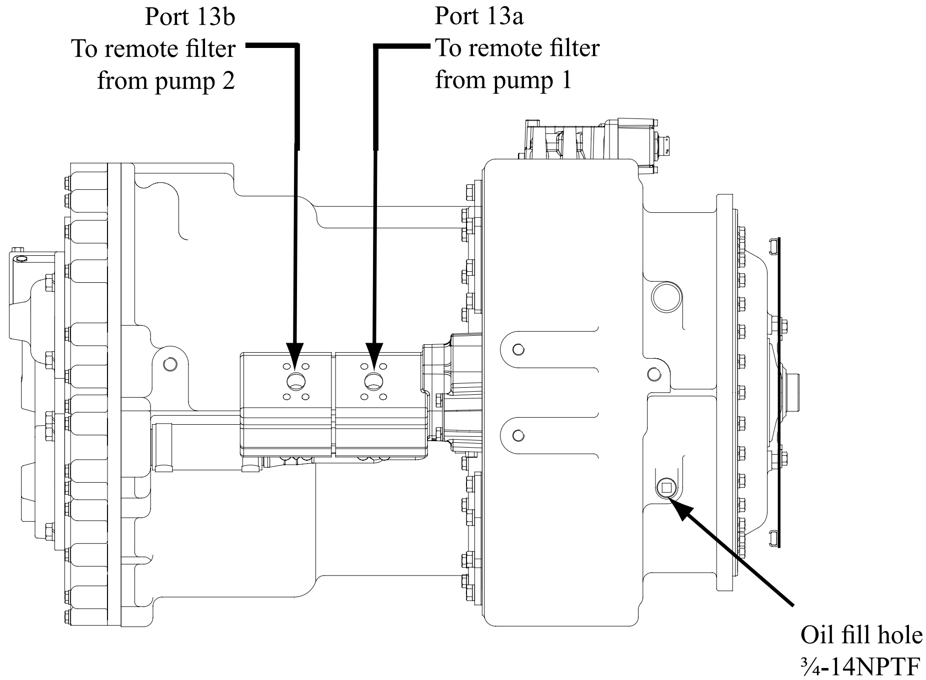


RIGHT VIEW



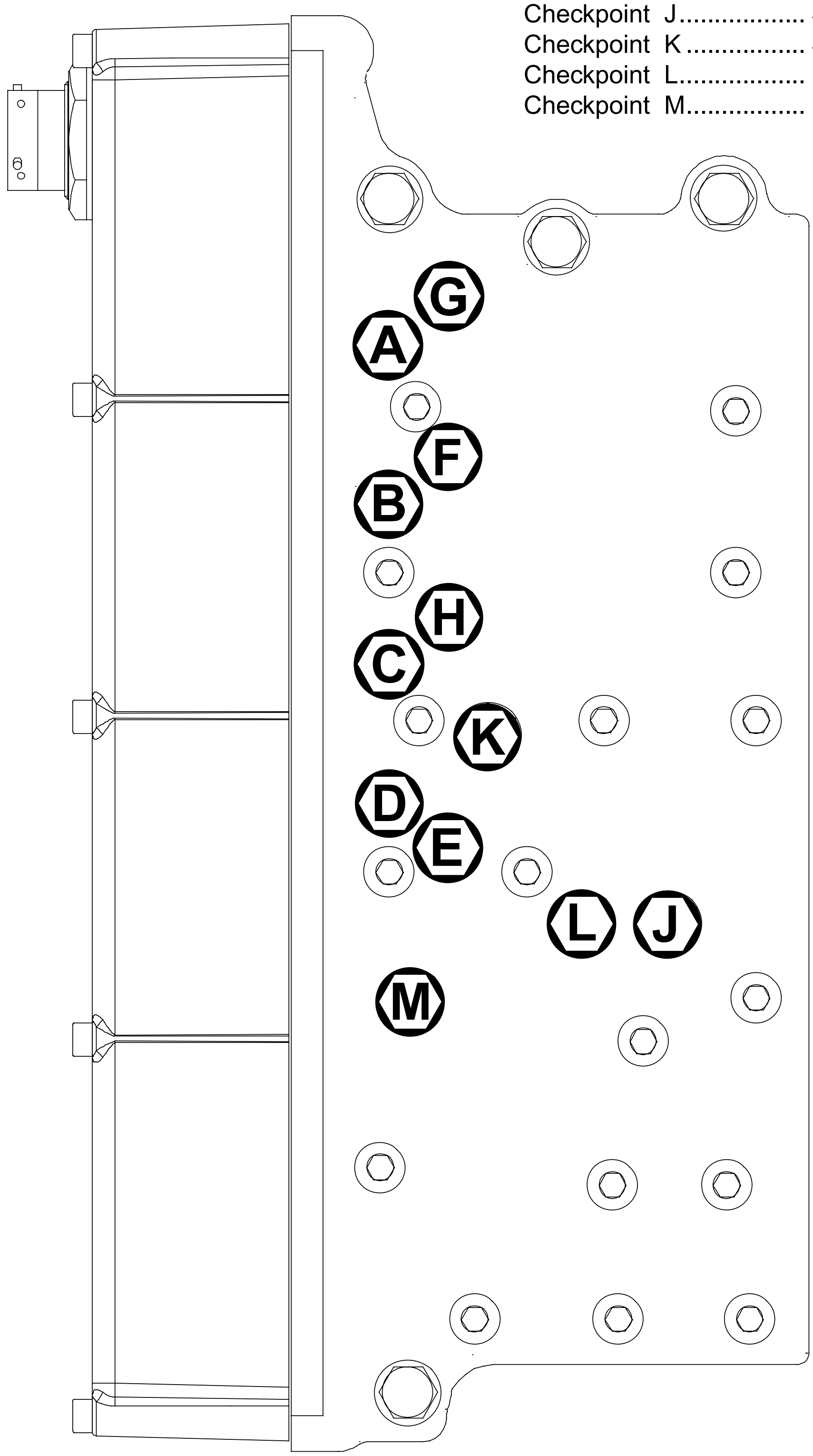
LEFT VIEW

7.4 CHECK POINTS (CONTINUED)



TOP VIEW

Checkpoint A .... VFS 4th/2nd
Checkpoint B .... VFS FWD
Checkpoint C .... VFS 3rd/1st
Checkpoint D .... VFS REV
Checkpoint E .... Booster REV
Checkpoint F .... Booster FWD
Checkpoint G .... Booster 4th/2nd
Checkpoint H .... Booster 3rd/1st
Checkpoint J .... System pressure (before Total Neutral)
Checkpoint K .... System pressure (After Total Neutral)
Checkpoint L.................. Pilot pressure
Checkpoint M................. Pressure check range clutches



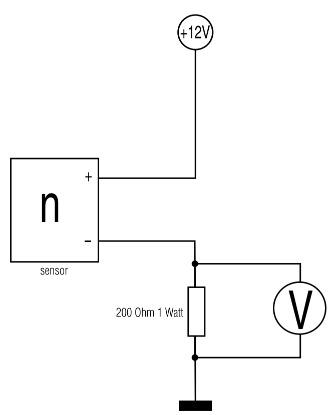
7.6 SPEED SENSOR - STATIC STANDALONE TEST

In order to be able to sense the currents, a series resistor of e.g. 200 Ω must be used. This resistor is integrated in the controller, but when the sensor is to be used, it must be connected externally.

The idea is to connect the sensor to an external power source and measure the DC voltage across the series resistor.

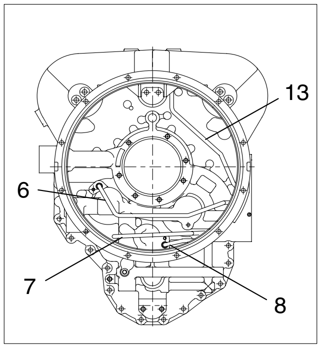
The voltage reading should be either 1.2V (from the 7mA ± 1mA current level) or 2.6 - 3.0V (for the 14mA ± 1mA current level).

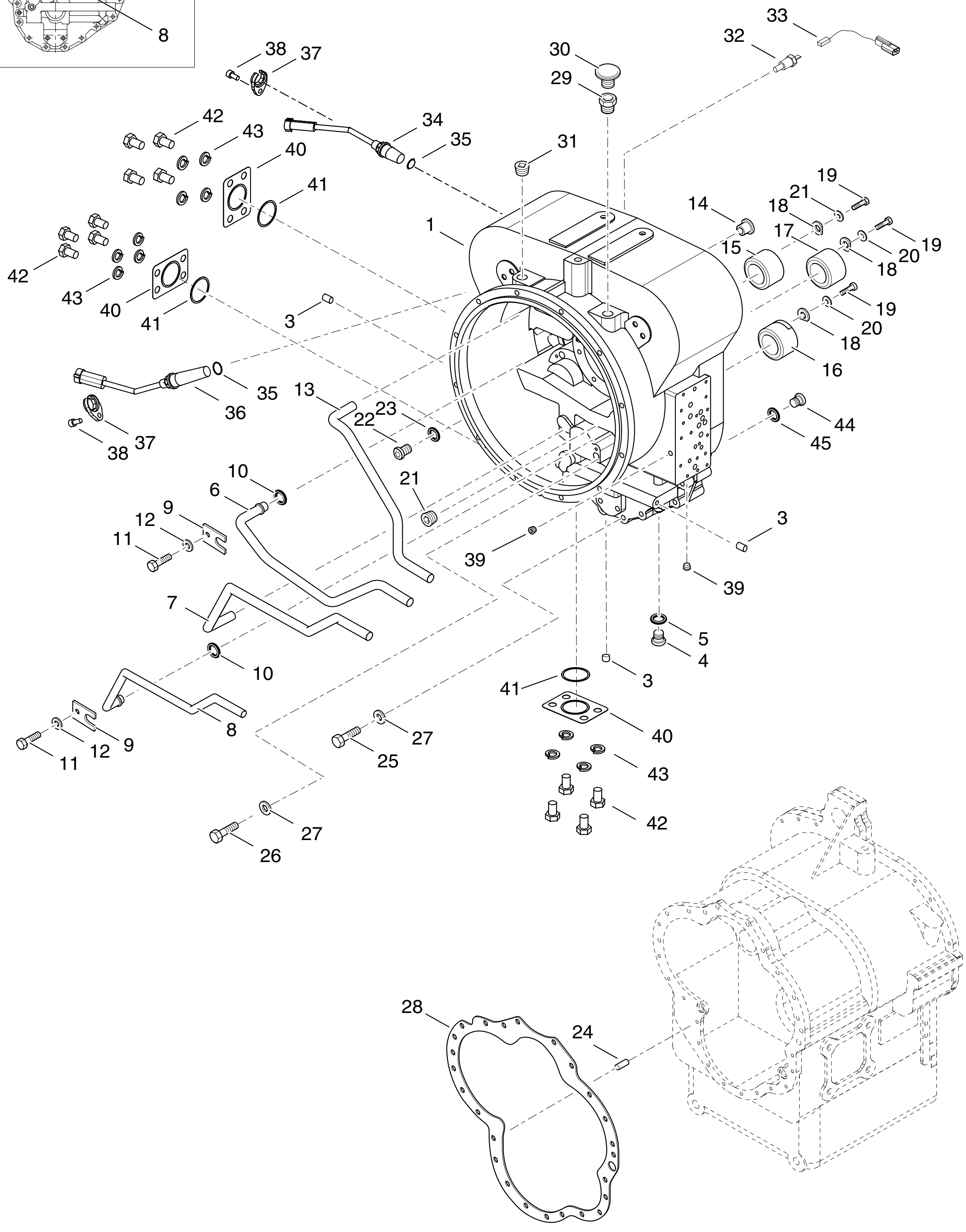
If the teeth can be moved slowly, distinct toggling between the two levels should be noticed.



8. SECTIONAL VIEWS & PARTS IDENTIFICATION

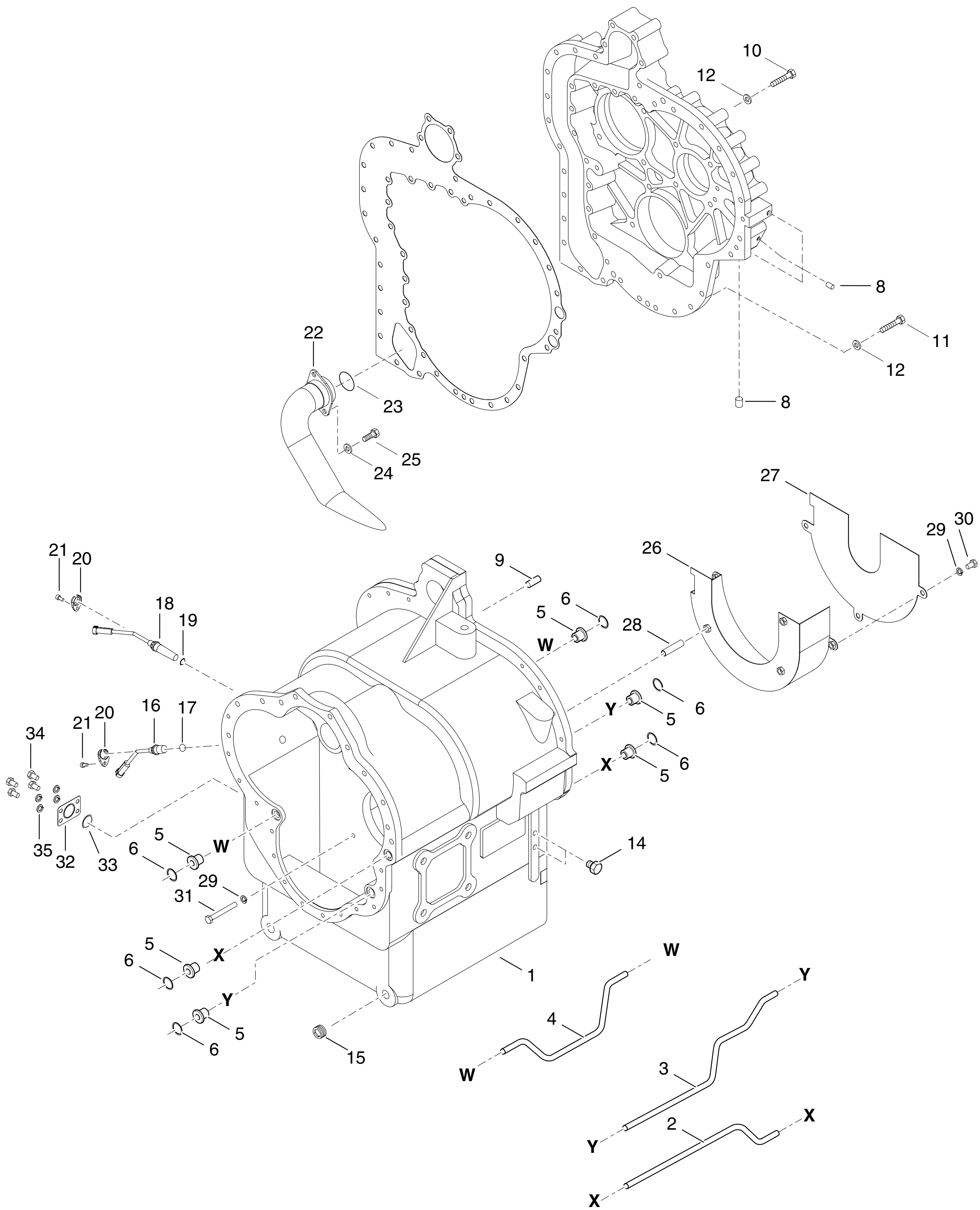
TE 27/32 TORQUE CONVERTER GROUP





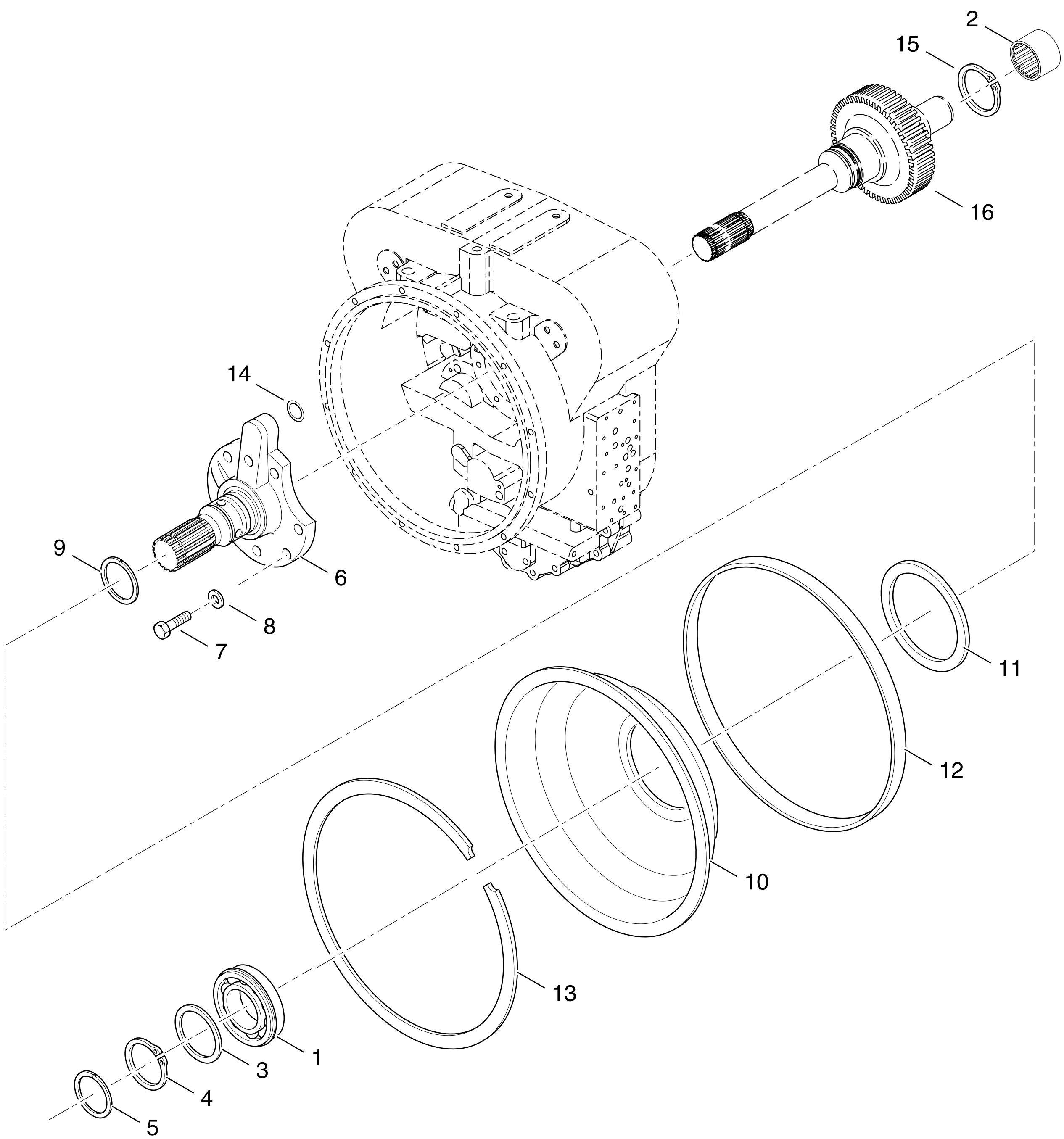
TE 27/32 TORQUE CONVERTER GROUP

Item	Description	Qty
1	Torque Converter	1
2	Not Illustrated	1
3	Plug - Expansion	3
4	Plug	1
5	“O” Ring	1
6	Tube	1
7	Tube	1
8	Tube	1
9	Clip	2
10	“O” Ring	2
11	Capscrew	2
12	Lockwasher	2
13	Tube	1
14	Sleeve	1
15	Sleeve	1
16	Sleeve	1
17	Sleeve	1
18	Washer	3
19	Capscrew	3
20	Lockwasher	3
21	Plug	1
22	Plug	2
23	“O” Ring	2
24	Pin - Dowel	2
25	Capscrew	14
26	Capscrew	9
27	Lockwasher	23
28	gasket - Converter to transmission case	1
29	Bushing	1
30	Breather - Air	1
31	Plug	1
32	Switch - Temperature	1
33	Adaptor - Temperature switch	1
34	Sensor - Speed	1
35	“O” Ring	1
36	Sensor - Speed 60mm	1
37	Support - Speed sensor	2
38	Capscrew	2
39	Plug	2
40	Cover - Split flange	3
41	“O” ring	3
42	Capscrew	12
43	Lockwasher	12
44	Plug	1
45	“O” Ring	1


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TE 27/32 TRANSMISSION CASE & REAR COVER GROUP

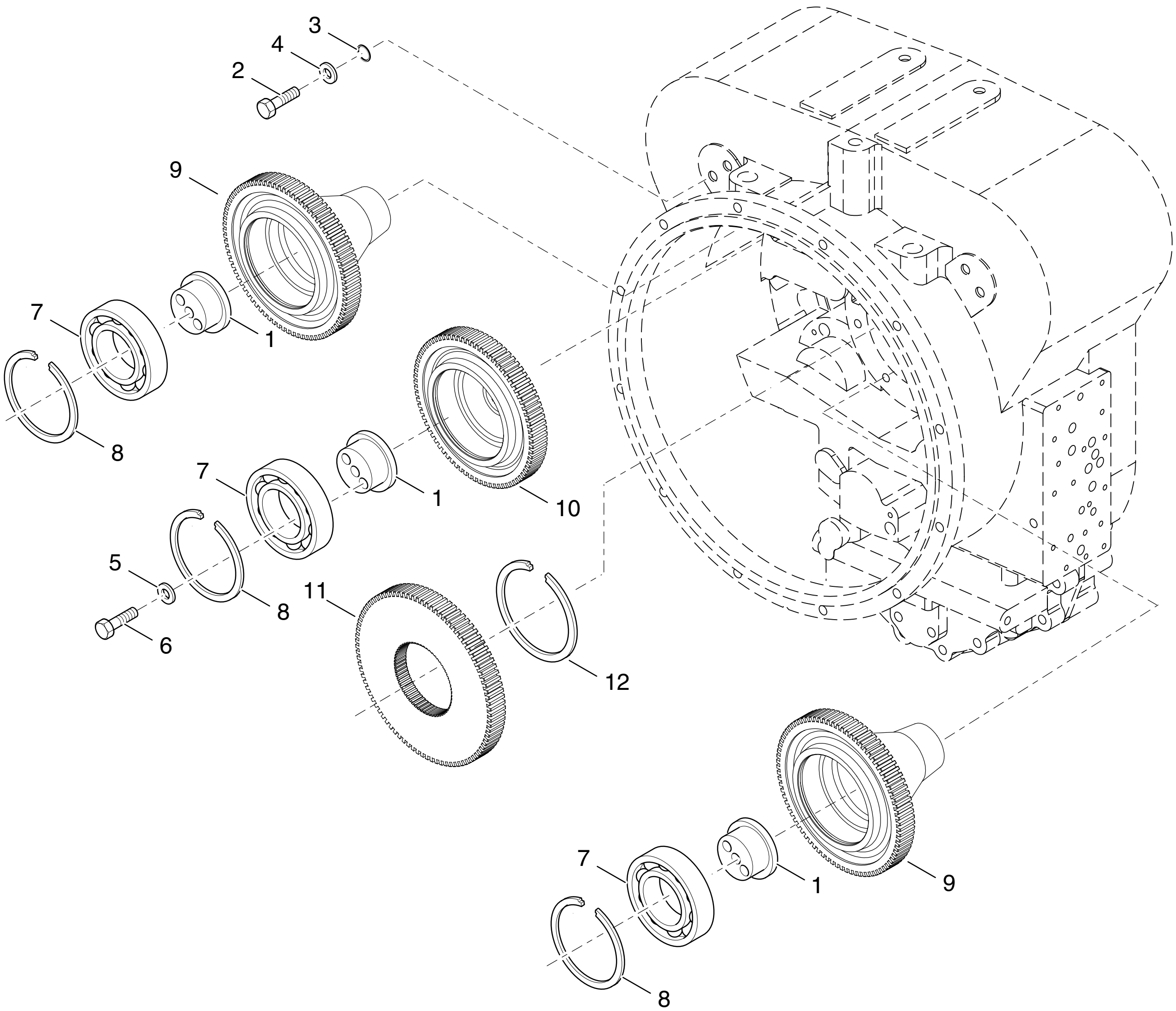
Item	Description	Qty
1	Case - Transmission	1
2	Tube - 1st speed clutch pressure	1
3	Tube - Low shaft rear bearing lube	1
4	Tube - 3rd speed clutch pressure	1
5	Sleeve - Pressure & lubr tube	1
6	“O” ring	6
7	Cover - Rear	1
8	Plug - Expansion	1
9	Pin - Dowel	2
10	Capscrew	37
11	Capscrew	7
12	Lockwasher	44
13	Gasket - Rear cover to transmission case	1
14	Plug	2
15	Plug - Magnetic drain	1
16	Sensor - Speed assy	1
17	“O” ring	1
18	Sensor - Speed assy	1
19	‘O” ring	1
20	Support - Speed sensor	2
21	Capscrew	2
22	Tube - Suction	1
23	“O” ring	1
24	Lockwasher	2
25	Capscrew	2
26	Baffle - Oil	1
27	Cover - Oil baffle	1
28	Tube - Oil baffle	3
29	Lockwasher	6
30	Capscrew	3
31	Screw	3
32	Cover - Split flange	1
33	“O” ring	1
34	Capscrew	4
35	Lockwasher	4


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TE 27/32 TURBINE SHAFT GROUP

Item	Description	Qty
1	Bearing - Turbine shaft front	1
2	Bearing - Turbine shaft rear	1
3	Spacer - Front bearing	1
4	Snapring	1
5	Ring - Piston	1
6	Stator support assy	1
7	Screw - Stator support	7
8	Lockwasher	7
9	Ring - Piston	1
10	Baffle - Oil	1
11	Seal - Oil baffle	1
12	Ring - Oil baffle seal	1
13	Ring - Oil baffle retaining	1
14	“O” Ring	1
15	Snapring	1
16	Turbine shaft	1

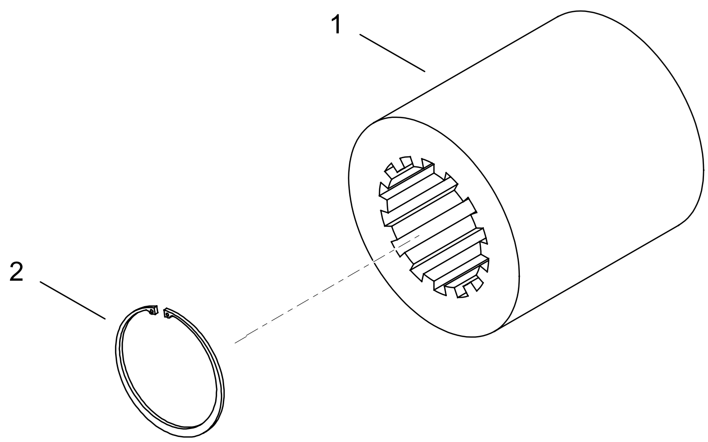
TE 27/32 PUMP DRIVE GROUP



TE 27/32 PUMP DRIVE GROUP

Item	Description	Qty
1	Support - Pump drive bearing	3
2	Screw - Bearing support	4
3	“O” Ring	4
4	Washer	4
5	Lockwasher	2
6	Screw - Bearing support	2
7	Bearing - Pump drive gear	3
8	Snapring	3
9	Gear - Aux. pump drive	2
10	Gear - Charging pump	1
11	Gear - Impeller hub	1
12	Snapring	1

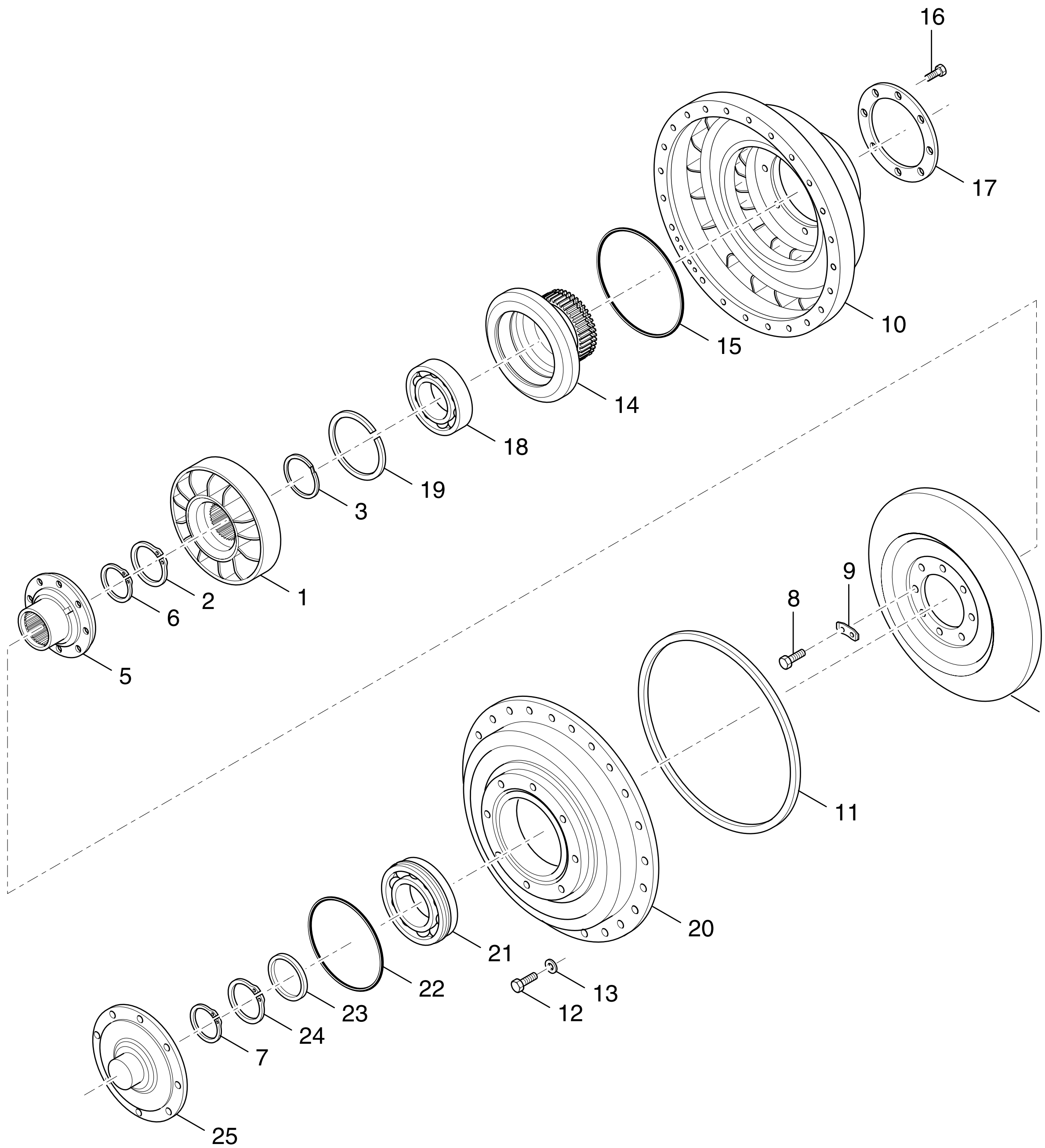
TE 27/32 ADAPTOR SLEEVE GROUP



TE 27/32 ADAPTOR SLEEVE GROUP

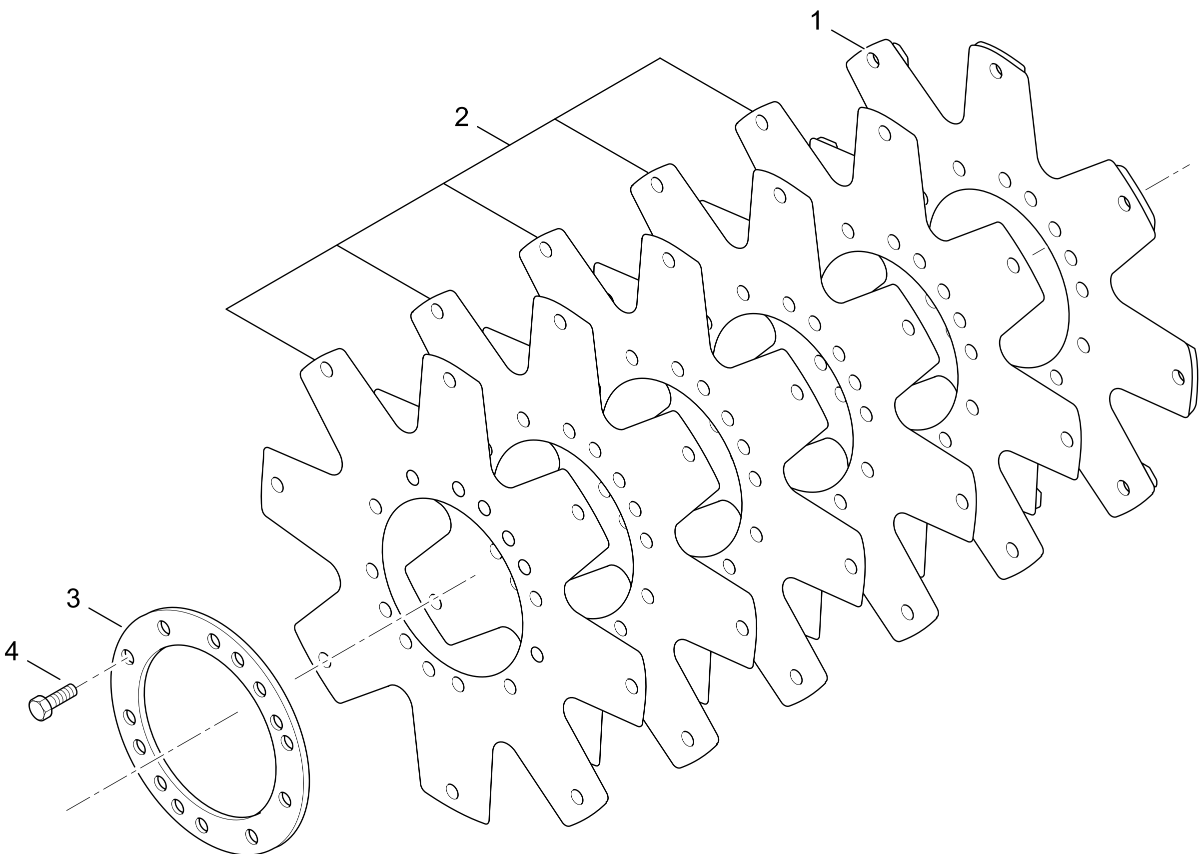
Item	Description	Qty
1	Sleeve - Pump drive	1
2	Snapring	1

TE 27/32 WHEEL GROUP



TE 27/32 WHEEL GROUP

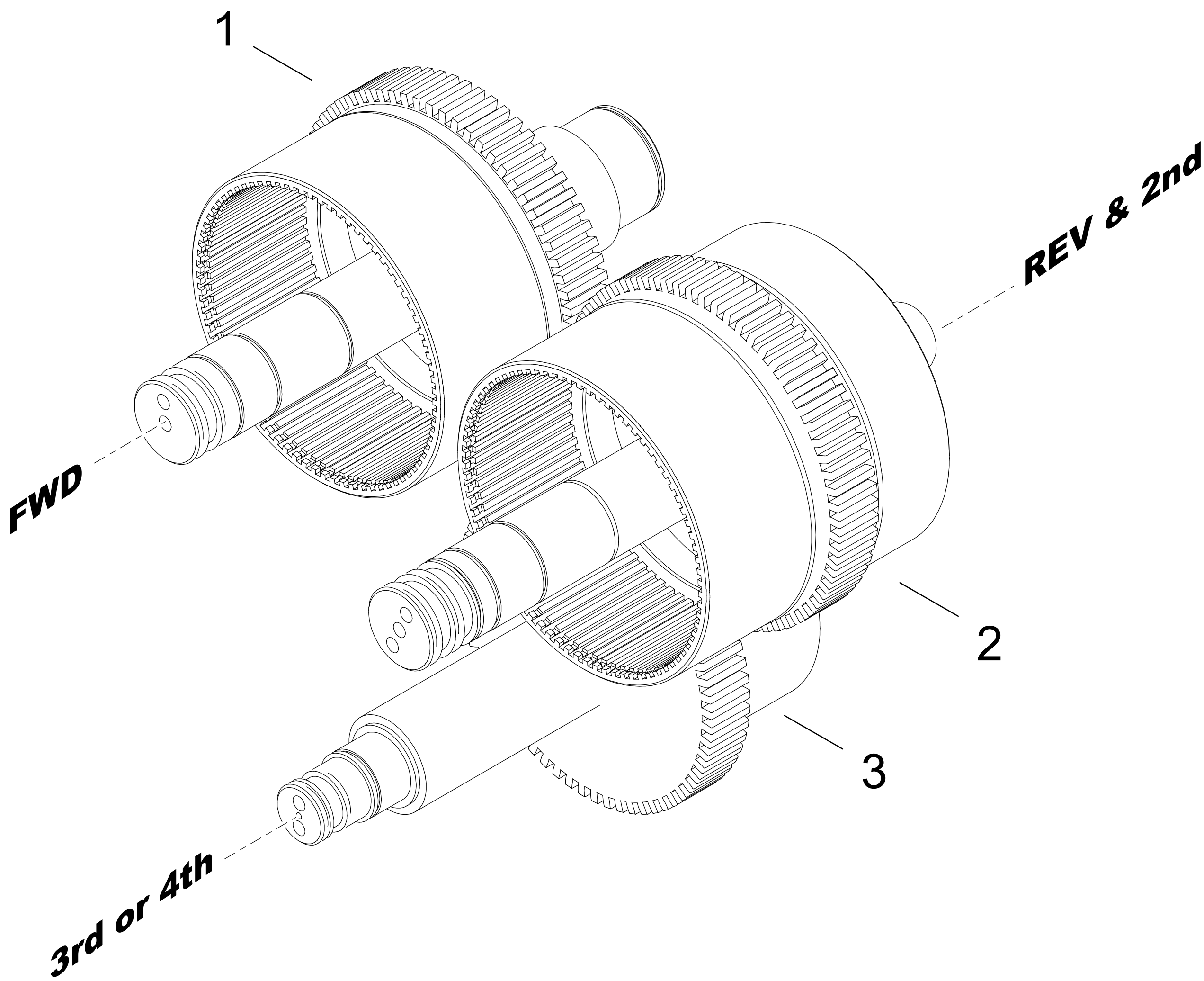
Item	Description	Qty
1	Member - Reaction	1
2	Snapring	1
3	Spacer - Reaction member	1
4	Turbine	1
5	Hub - Turbine	1
6	Snapring	1
7	Snapring	1
8	Screw - Turbine hub	10
9	Locktab	5
10	Impeller	1
11	"O" Ring	1
12	Screw	32
13	Lockwasher	32
14	Hub - Impeller	1
15	"O" Ring	1
16	Screw	8
17	Ring - Impeller hub screw backing	1
18	Bearing	1
19	Snapring	1
20	Cover - Impeller	1
21	Bearing - Turbine hub	1
22	"O" Ring	1
23	Spacer	1
24	Snapring	1
25	Hub - Impeller cover	1


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TE 27/32 DRIVE PLATE GROUP

Item	Description	Qty
1	Assembly - Drive plate and (when used) welded nuts	1
2	Plate - Drive	5
3	Ring - Backing	1
4	Capscrew	14

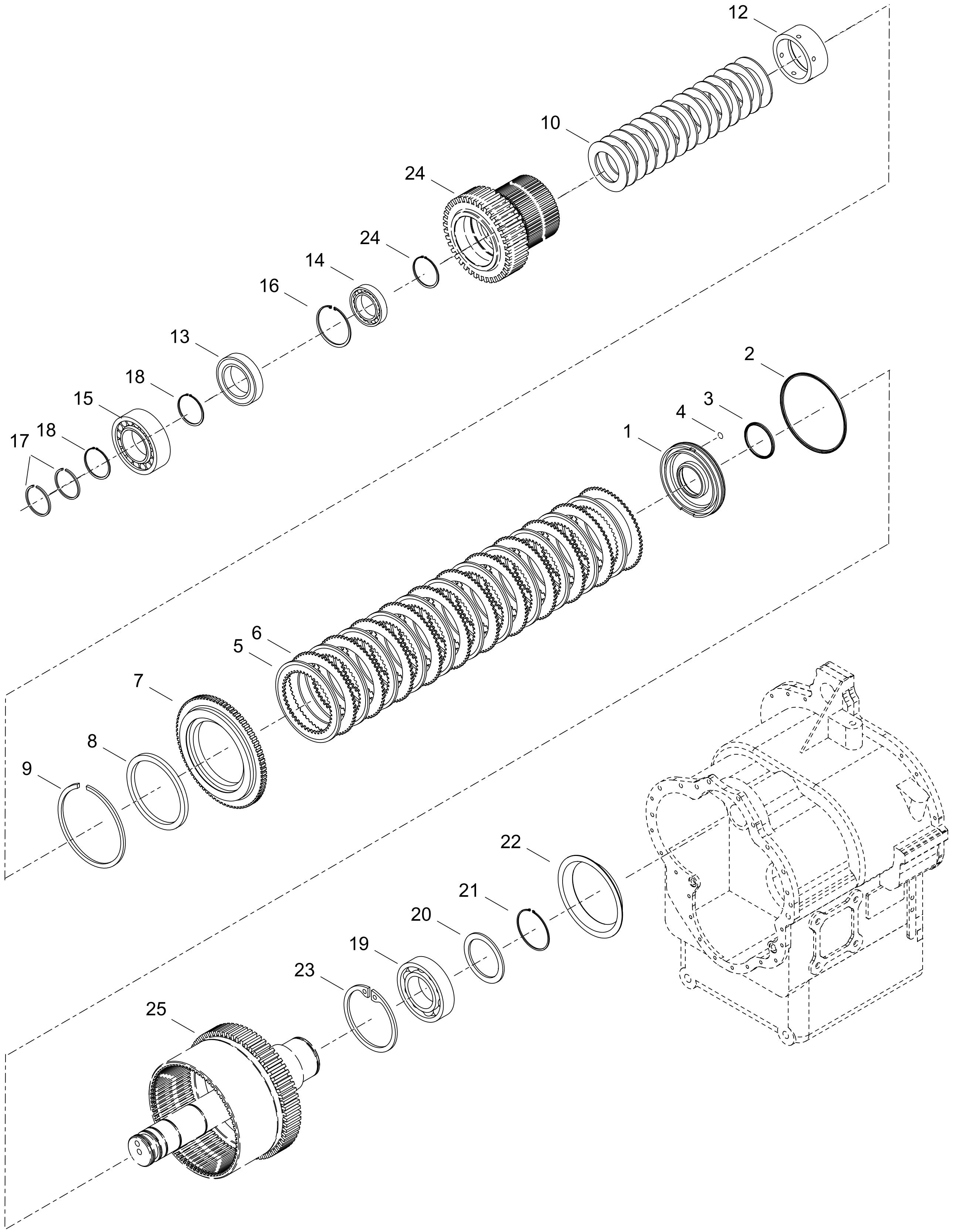
TE 27/32 FWD & REV/2ND AND 3TH OR 4TH CLUTCH SHAFT ASSY



TE 27/32 FWD & REV/2ND AND 3TH OR 4TH CLUTCH SHAFT ASSY

Item	Description	Qty
1	Fwd shaft drum assy	1
2	Rev/2nd shaft drum assy	1
3	3rd shaft drum assy (on 3 speed)	1
3	4th shaft drum shaft assy (on 4 speed)	1

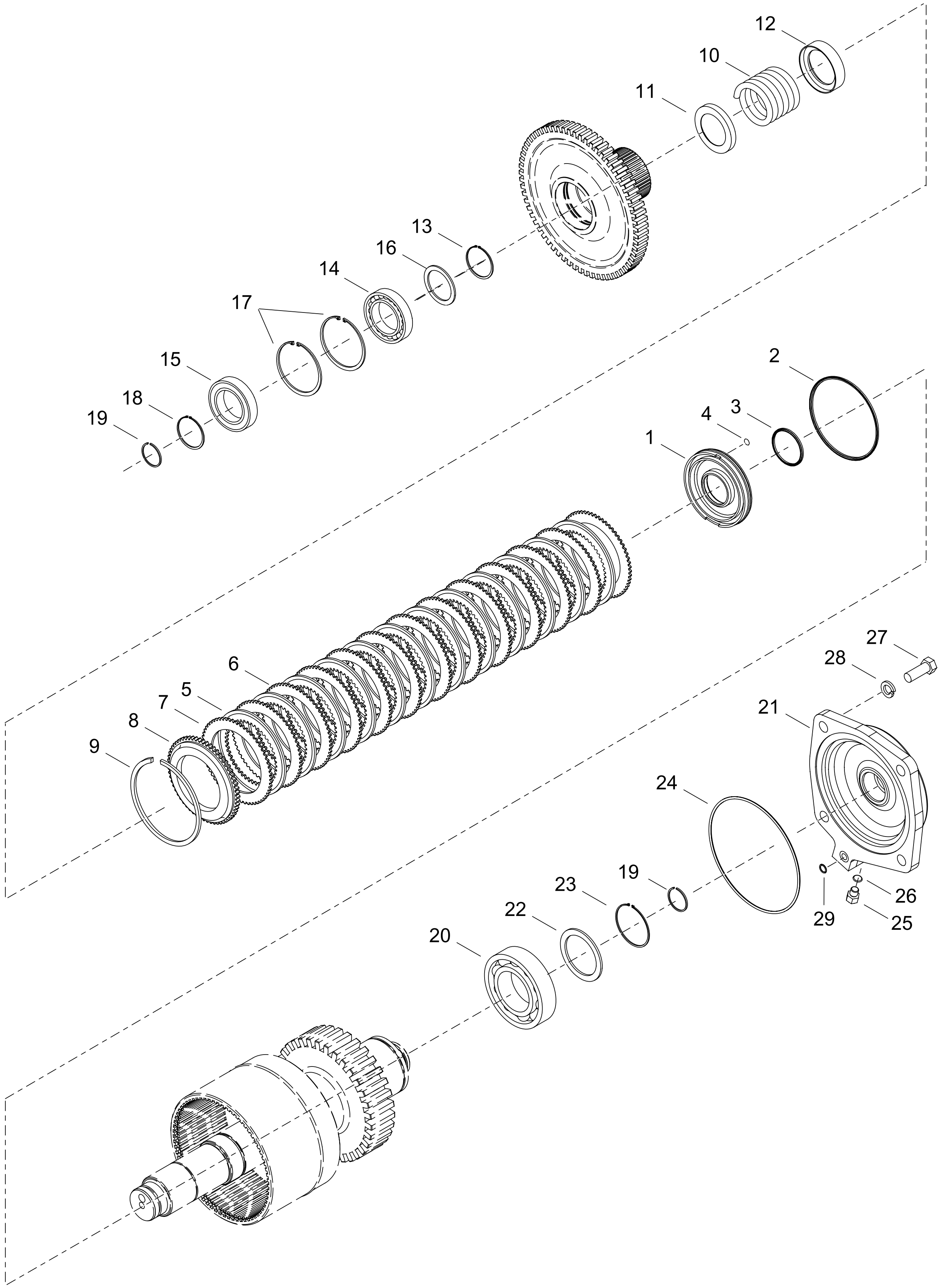
TE 27/32 FORWARD CLUTCH SHAFT GROUP



TE 27/32 FORWARD CLUTCH SHAFT GROUP

Item	Description	Qty
1	Piston	1
2	Seal - Piston outer	1
3	Seal - Piston inner	1
4	Screen (not sold seperate)	1
5	Disc - Clutch inner	11
6	Disc - Clutch outer	11
7	Plate - End	1
8	Seal	1
9	Snapring	1
10	Washer - Belleville	15
11	Ring - Retaining	1
12	Spacer - Clutch piston	1
13	Bearing - Clutch driven gear	1
14	Bearing	1
15	Bearing	1
16	Ring - Retaining	1
17	Ring - Piston	2
18	Ring - Retaining	2
19	Bearing	1
20	Spacer	1
21	Snapring	1
22	Retainer - Oil	1
23	Snapring	1

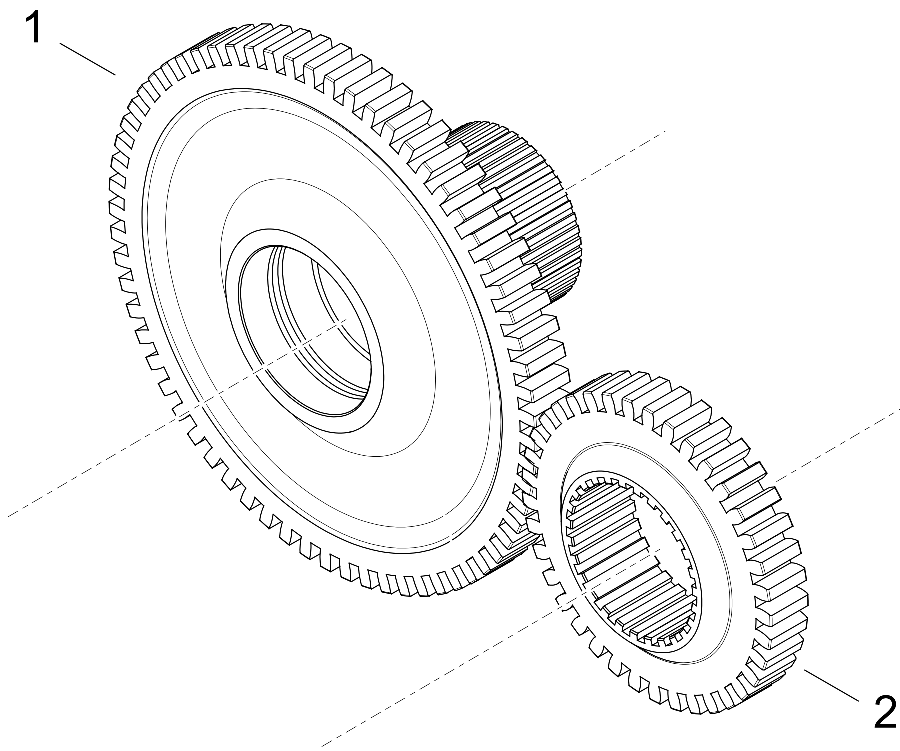
TE 27/32 3RD SPEED CLUCTH SHAFT GROUP



TE 27/32 3RD SPEED CLUCTH SHAFT GROUP

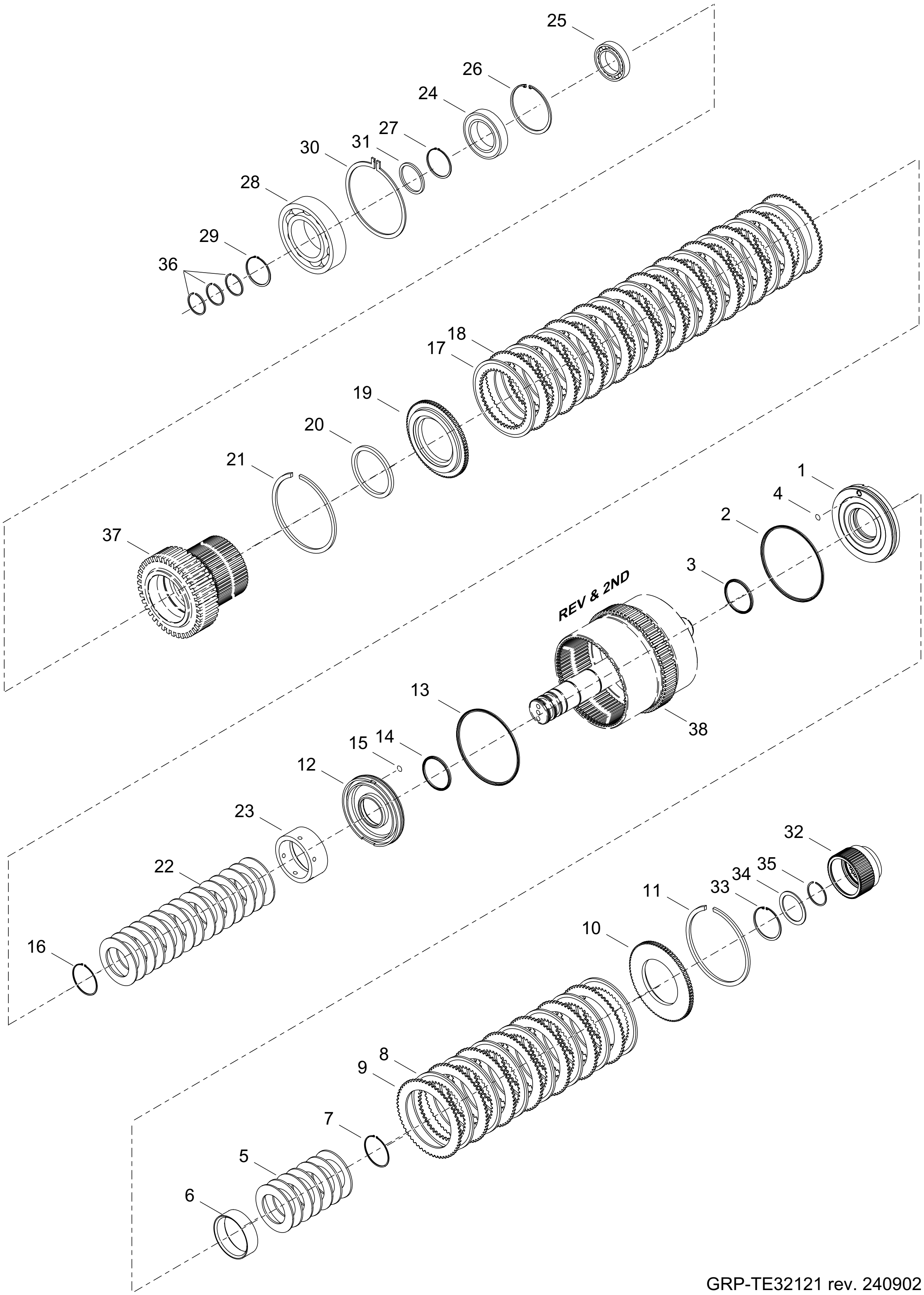
Item	Description	Qty
1	Piston	1
2	Seal - Piston outer	1
3	Seal - Piston inner	1
4	Screen (not sold seperate)	1
5	Disc - Clutch inner	11
6	Disc - Clutch outer	11
7	Disc - Clutch outer half	2
8	Plate - End	1
9	Snapring	1
10	Washer - Belleville	15
11	Spacer - Clutch piston	1
12	Retainer - Spring	1
13	Ring - Retainer	1
14	Bearing	1
15	Bearing	1
16	Washer	1
17	Snapring	2
18	Snapring	1
19	Ring - Piston	2
20	Bearing	1
21	Cap - 3rd speed shaft rear bearing	1
22	Spacer	1
23	Snapring	1
24	“O” Ring	1
25	Plug	1
26	“O” Ring	1
27	Capscrew	4
28	Lockwasher	4
29	“O” RIng	1

TE 27/32 3RD SPEED GEAR



TE 27/32 3RD SPEED GEAR

Item	Description	Qty
1	Gear - 3rd speed	1
2	Gear - 3rd speed driven	1

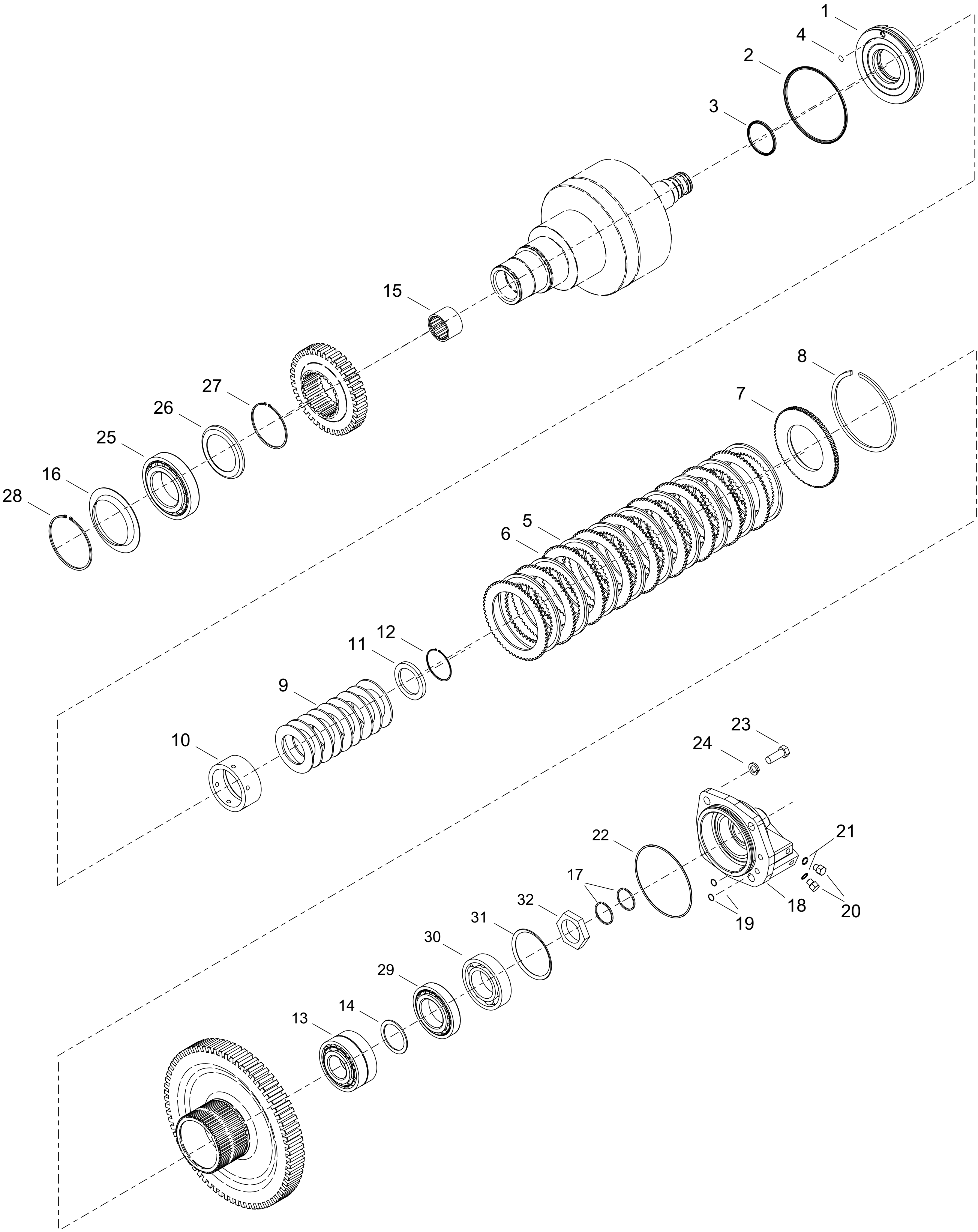


GRP-TE32121 rev. 240902

TE 27/32 REV / 2ND SCHAFT GROUP

Item	Description	Qty
1	Piston	1
2	Seal - Clutch piston outer	1
3	Seal - Clutch piston inner	1
4	Screen (Not Sold Separate)	1
5	Washer - Belleville	7
6	Spacer - Clutch piston	1
7	Ring - Retaining	1
8	Disc - Clutch inner	7
9	Disc - Clutch outer	7
10	Plate - End	1
11	Snapring	1
12	Piston	1
13	Seal - Clutch piston outer	1
14	Seal - Clutch piston inner	1
15	Screen (Not Sold Separate)	1
16	Ring - Retaining	1
17	Disc - Clutch inner	11
18	Disc - Clutch outer	11
19	Plate - End	1
20	Seal	1
21	Snapring	1
22	Washer - Bellevile	15
23	Spacer - Clutch piston	1
24	Bearing	1
25	Bearing	1
26	Ring - Retaining	1
27	Ring - Retaining	1
28	Bearing	1
29	Ring - Retaining	1
30	Ring	1
31	Washer - Bearing thrust	1
32	Hub - 2nd Clutch disc	1
33	Snapring	1
34	Retainer	1
35	Snapring	1
36	Ring - Piston	3

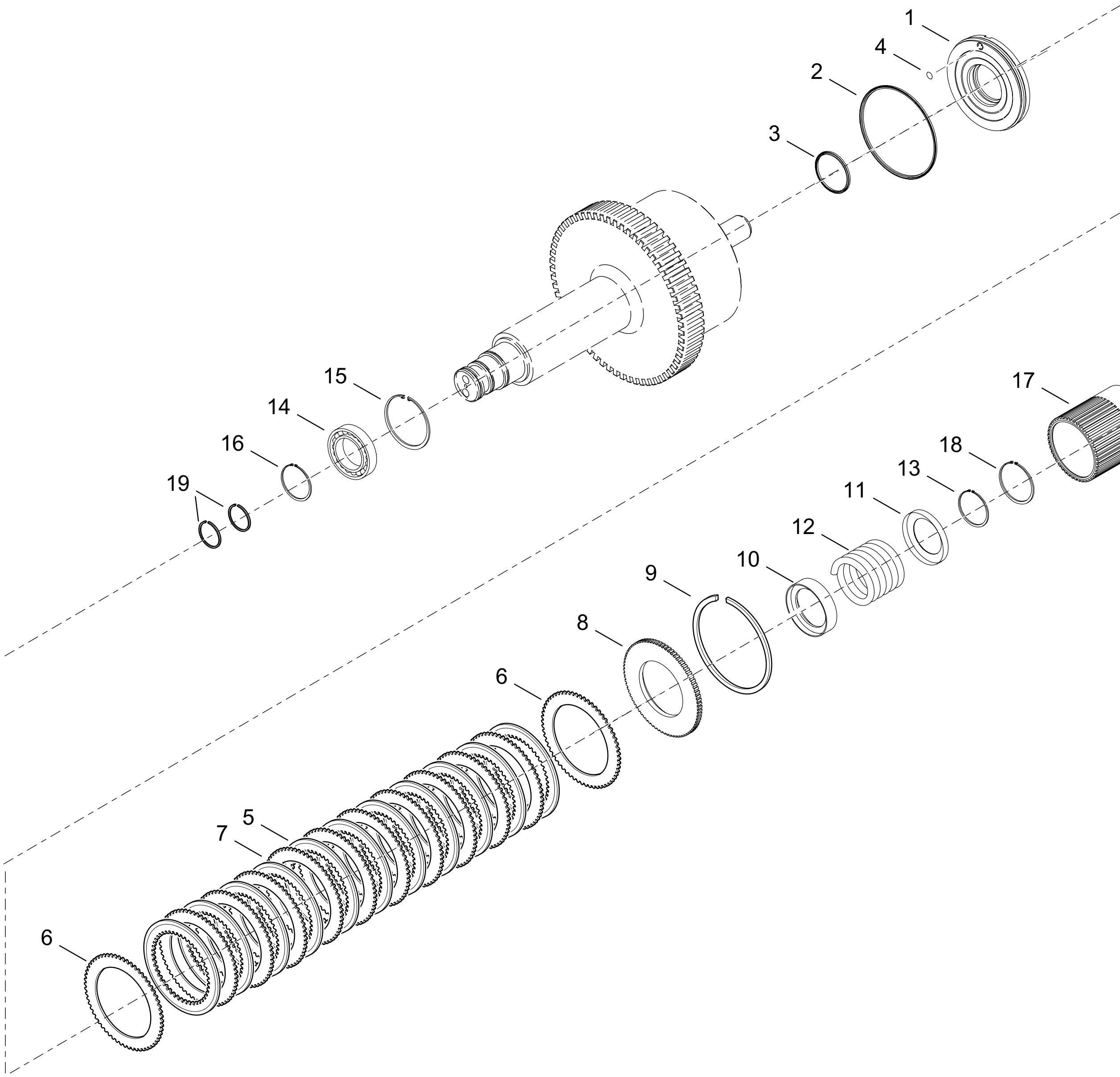
TE 27/32 1ST SPEED CLUTCH SHAFT GROUP



TE 27/32 1ST SPEED CLUTCH SHAFT GROUP

Item	Description	Qty
1	Piston	1
2	Seal - Piston outer	1
3	Seal - Piston inner	1
4	Screen (not sold seperate)	1
5	Disc - Clutch inner	11
6	Disc - Clutch outer	11
7	Plate - End	1
8	Snapring	1
9	Washer - Belleville	9
10	Spacer - Clutch piston	1
11	Retainer - Spring	1
12	Ring - Retainer	1
13	Bearing	1
14	Washer	1
15	Bearing	1
16	Retainer - Oil	1
17	Ring - Piston	2
18	Cap - Bearing	1
19	“O” Ring	2
20	Plug	2
21	“O” Ring	2
22	“O” Ring	1
23	Capscrew	4
24	Lockwasher	4
25	Bearing	1
26	Spacer - Bearing	1
27	Snapring	1
28	Snapring	1
29	Bearing	1
30	Bearing	1
31	Spring - Disc	1
32	Nut	1

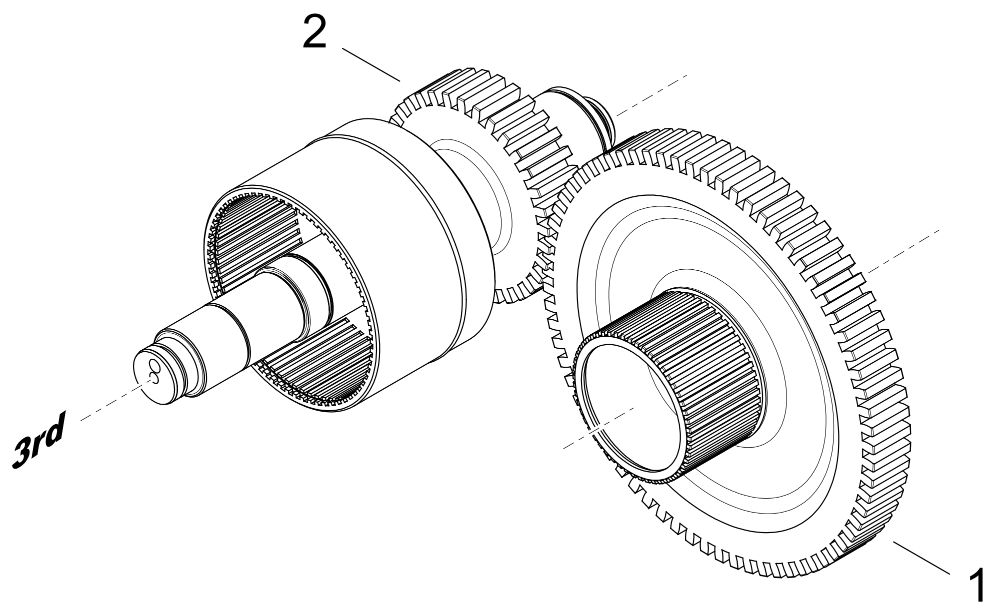
TE 27/32 4TH SPEED CLUTCH SHAFT GROUP



TE 27/32 4TH SPEED CLUTCH SHAFT GROUP

Item	Description	Qty
1	Piston	1
2	Seal - Piston outer	1
3	Seal - Piston inner	1
4	Screen (not sold seperate)	1
5	Disc - Clutch inner	11
6	Disc - Clutch outer half	2
7	Disc - Clutch outer	11
8	Plate - End	1
9	Snapring	1
10	Spacer - Clutch piston	1
11	Retainer - Spring	1
12	Spring	1
13	Ring - Retainer	1
14	Bearing	1
15	Snapring	1
16	Snapring	1
17	Hub	1
18	Snapring	1
19	Ring - Piston	2

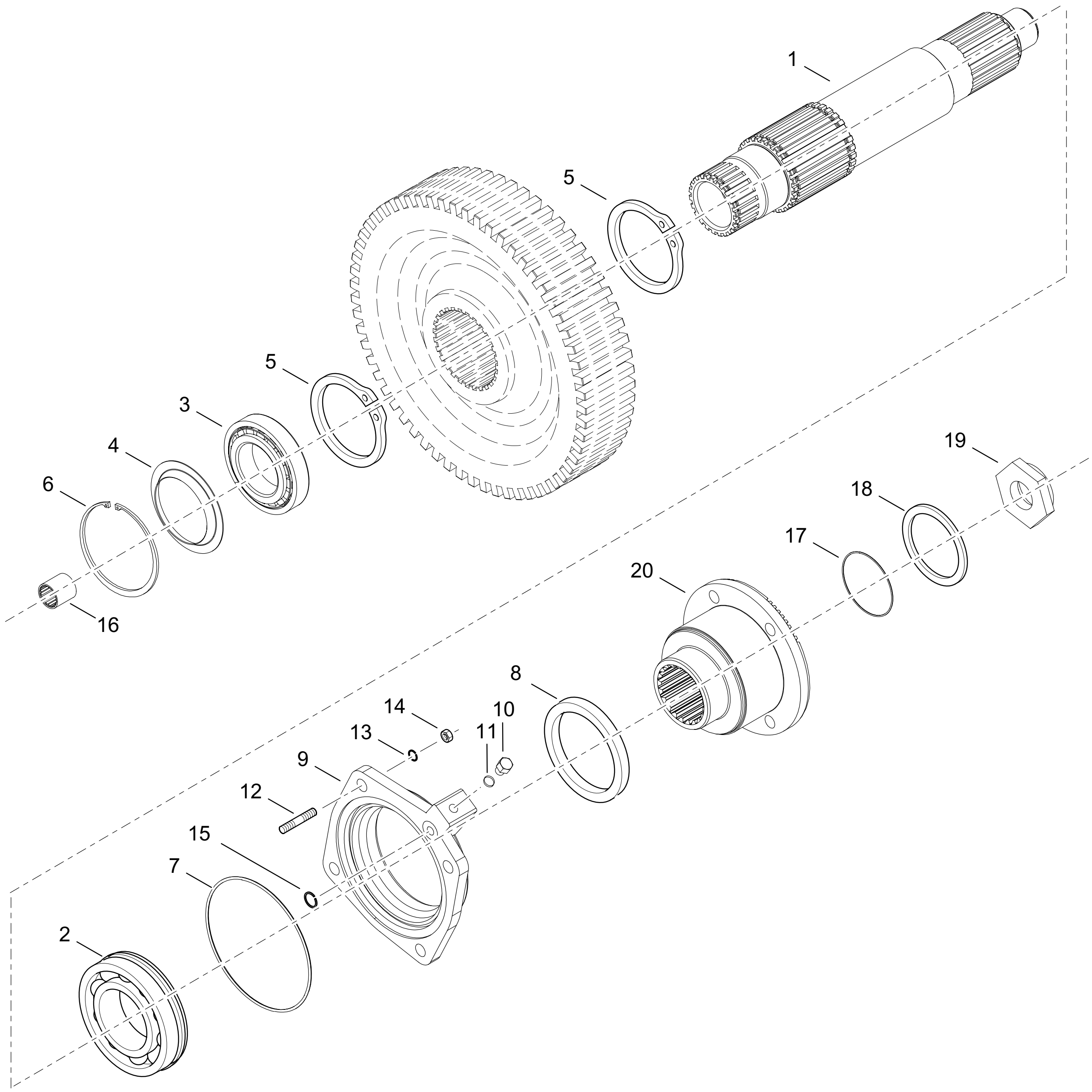
TE 27/32 1ST SHAFT GEAR GROUP



TE 27/32 1ST SHAFT GEAR GROUP

Item	Description	Qty
1	Gear - Idler	1
2	Assy - 1st speed clutch	1

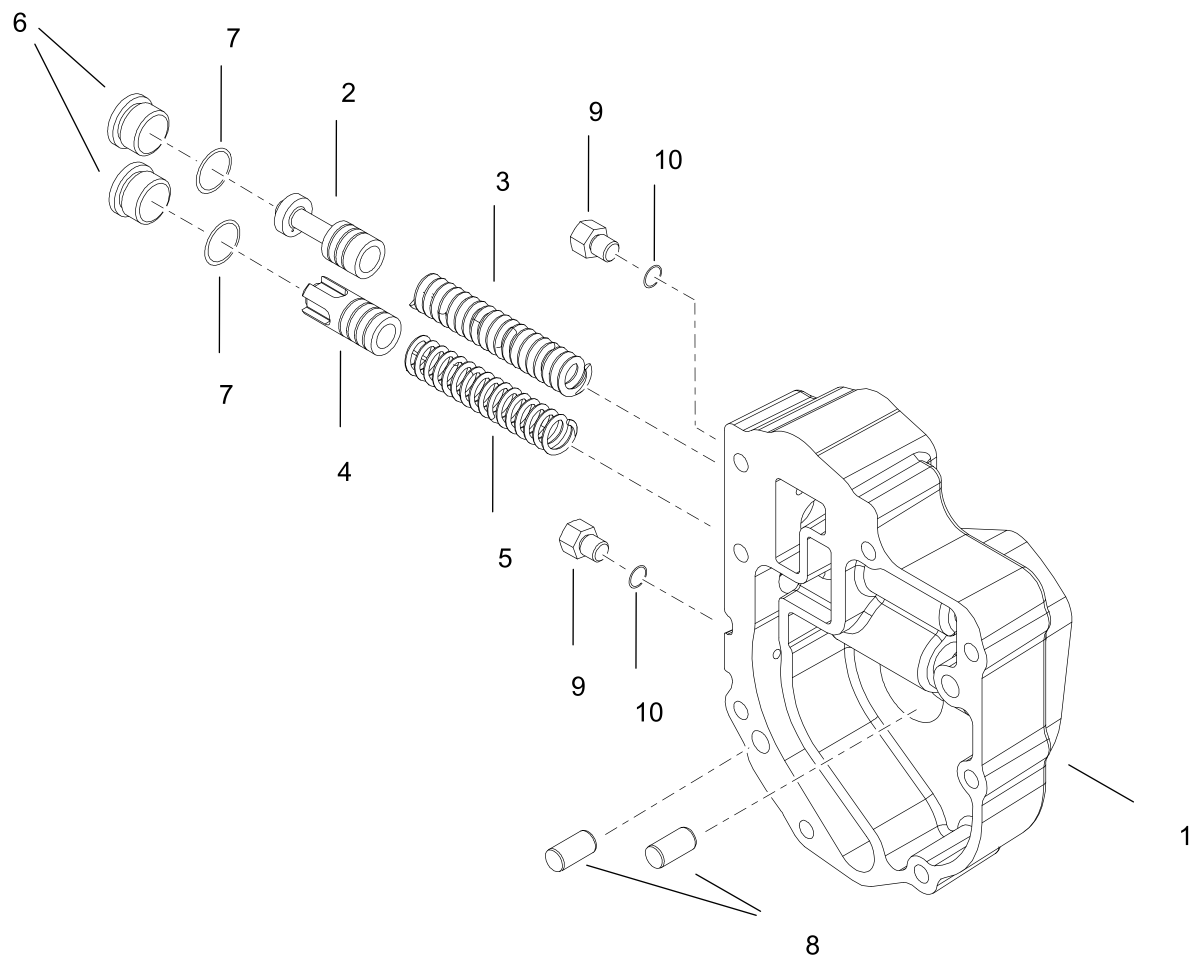
TE 27/32 OUTPUT SHAFT GROUP



TE 27/32 OUTPUT SHAFT GROUP

Item	Description	Qty
1	Shaft - Output	1
2	Bearing	1
3	Bearing	1
4	Retainer - Oil	1
5	Snapring	1
6	Snapring	1
7	“O” Ring	1
8	Seal - Output oil	1
9	Cap - Bearing	1
10	Plug	1
11	“O” Ring	1
12	Stud	4
13	Lockwasher	4
14	Nut	4
15	“O” Ring	1
16	Bearing	1
17	“O” Ring	1
18	Washer - Flange	1
19	Locknut	1
20	Flange	1

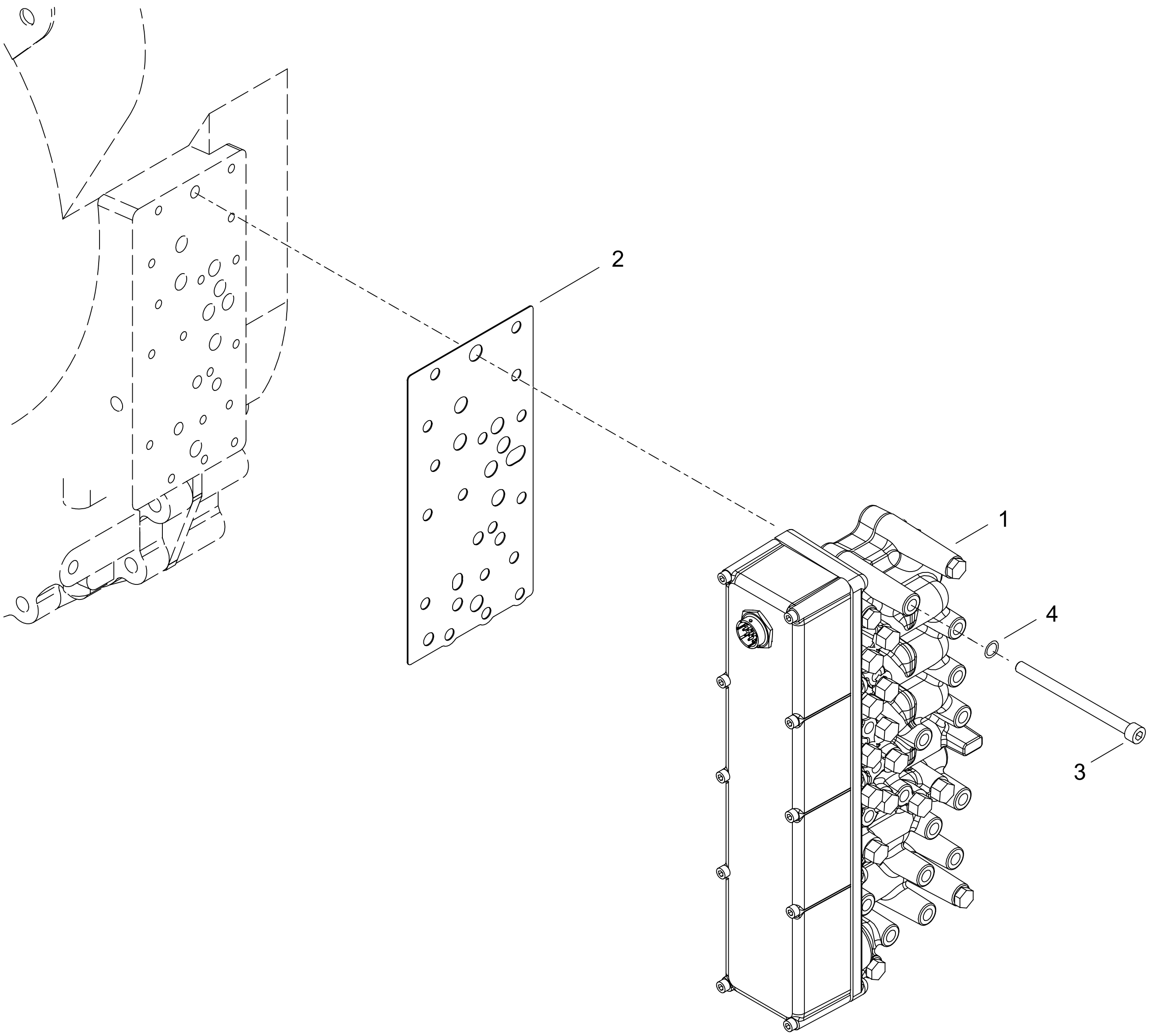
TE 27/32 REGULATOR VALVE GROUP



TE 27/32 REGULATOR VALVE GROUP

Item	Description	Qty
1	Assy - Valve regulator	1
2	Gasket - Valve to converter housing	1
3	“O” Ring	1
4	Pump - Hydraulic	1
5	Shaft - Gear to pump	1
6	Snapring	1
7	Screw	2
8	Adaptor - Suction tube side	1
9	Adaptor - Suction transmission case side	1
10	Capscrew	8
11	Hose - Suction	1
12	Clamp - suction	2
13	“O” Ring	2
14	Screw	8
15	Lockwasher	8
16	Cap - Flange	1
17	“O” Ring	1
18	Capscrew	4
19	Lockwasher	4

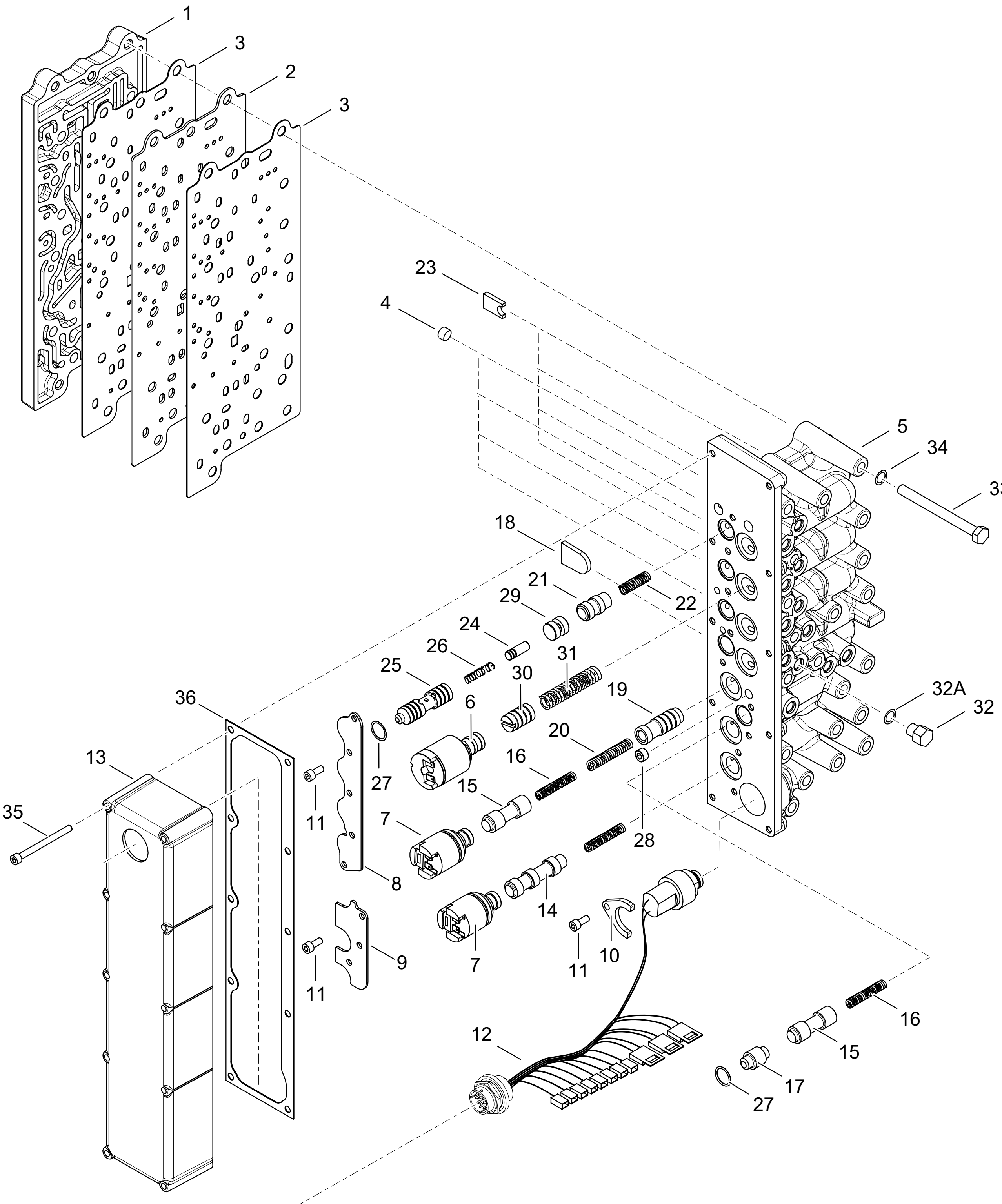
TE 27/32 CONTROL VALVE GROUP



TE 27/32 CONTROL VALVE GROUP

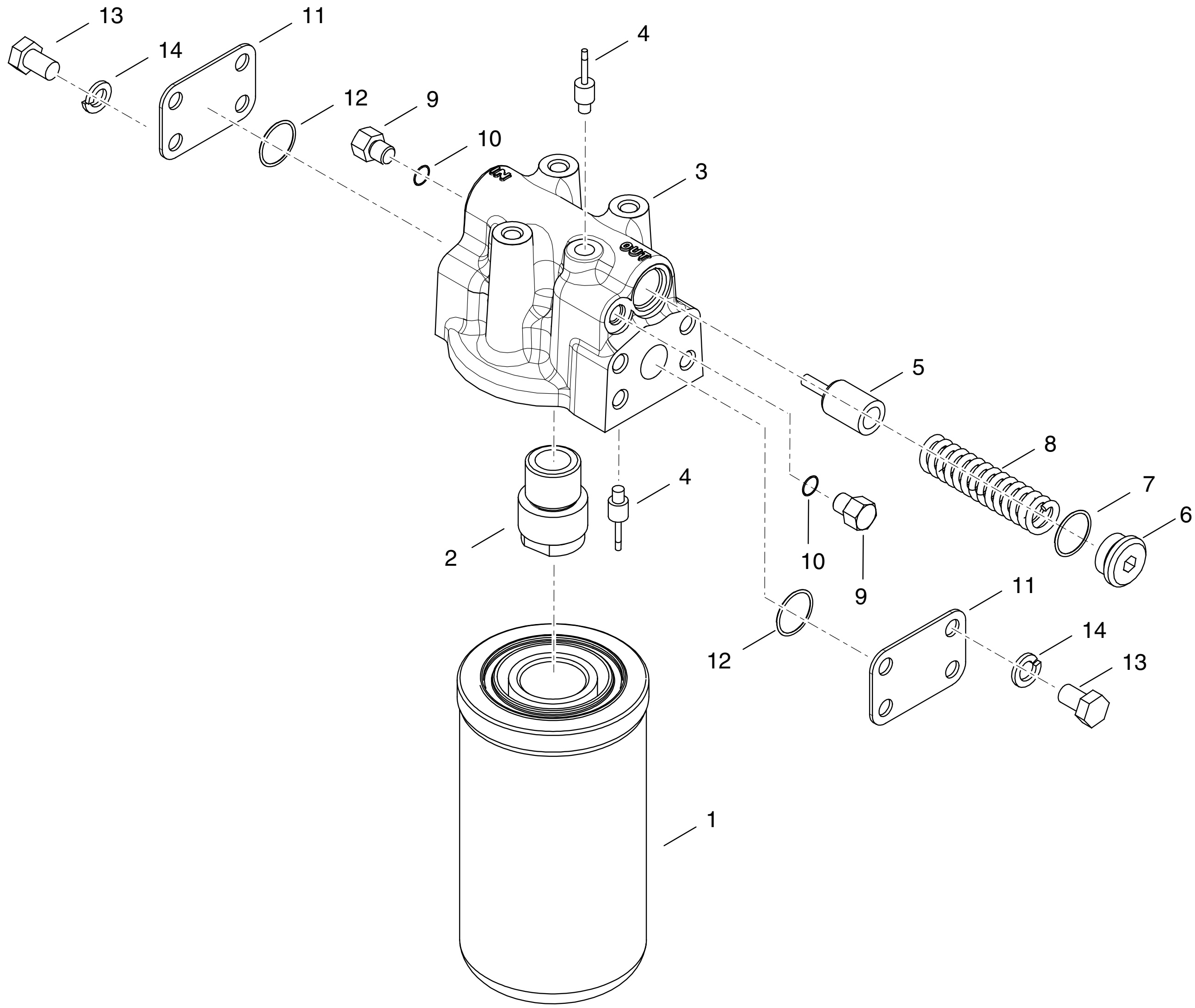
Item	Description	Qty
1	Assy - Control valve	1
2	Gasket	1
3	Screw	17
4	Lockwasher	17

TE 27/32 CONTROL VALVE GROUP (CONT.)



TE 27/32 CONTROL VALVE GROUP (CONT.)

Item	Description	Qty
1	Plate - Spacer	1
2	Plate - Adapter	1
3	Gasket	2
4	Plug - Restriction (Not Sold Seperate)	4
5	Spool (Not Sold Seperate)	1
6	VFS (Not Sold Seperate)	4
7	Solenoid 24V (Not Sold Seperate)	3
8	Clamp VFS (Not Sold Seperate)	1
9	Clamp On / Off (Not Sold Seperate)	1
10	Clamp pressure switch	1
11	Screw	9
12	Harness - Wiring	1
13	Cover - Solenoids	1
14	Spool (Not Sold Seperate)	2
15	Spool (Not Sold Seperate)	2
16	Spring -pilot valve (Not Sold Seperate)	4
17	Spool - Switch pilot (Not Sold Seperate)	1
18	Plate - Separater (Not Sold Seperate)	1
19	Spool - Pressure reducer (Not Sold Seperate)	1
20	Spring - Pressure reducer (Not Sold Seperate)	1
21	Spool - Pressure check (Not Sold Seperate)	4
22	Spring - Pressure check (Not Sold Seperate)	4
23	Plate - Separater (Not Sold Seperate)	4
24	Stop (Not Sold Seperate)	4
25	Intensifier - Spool (Not Sold Seperate)	4
26	Spring (Not Sold Seperate)	4
27	“O” Ring (Not Sold Seperate)	5
28	Plug - restriction (Not Sold Seperate)	1
29	Stop - Spool (Not Sold Seperate)	4
30	Spool - Accumulator (Not Sold Seperate)	4
31	Spring - Accumulator (Not Sold Seperate)	4
32	Plug	12
33	Capscrew	4
34	Lockwasher	4
35	Screw	10
36	Gasket - Protection cover	1

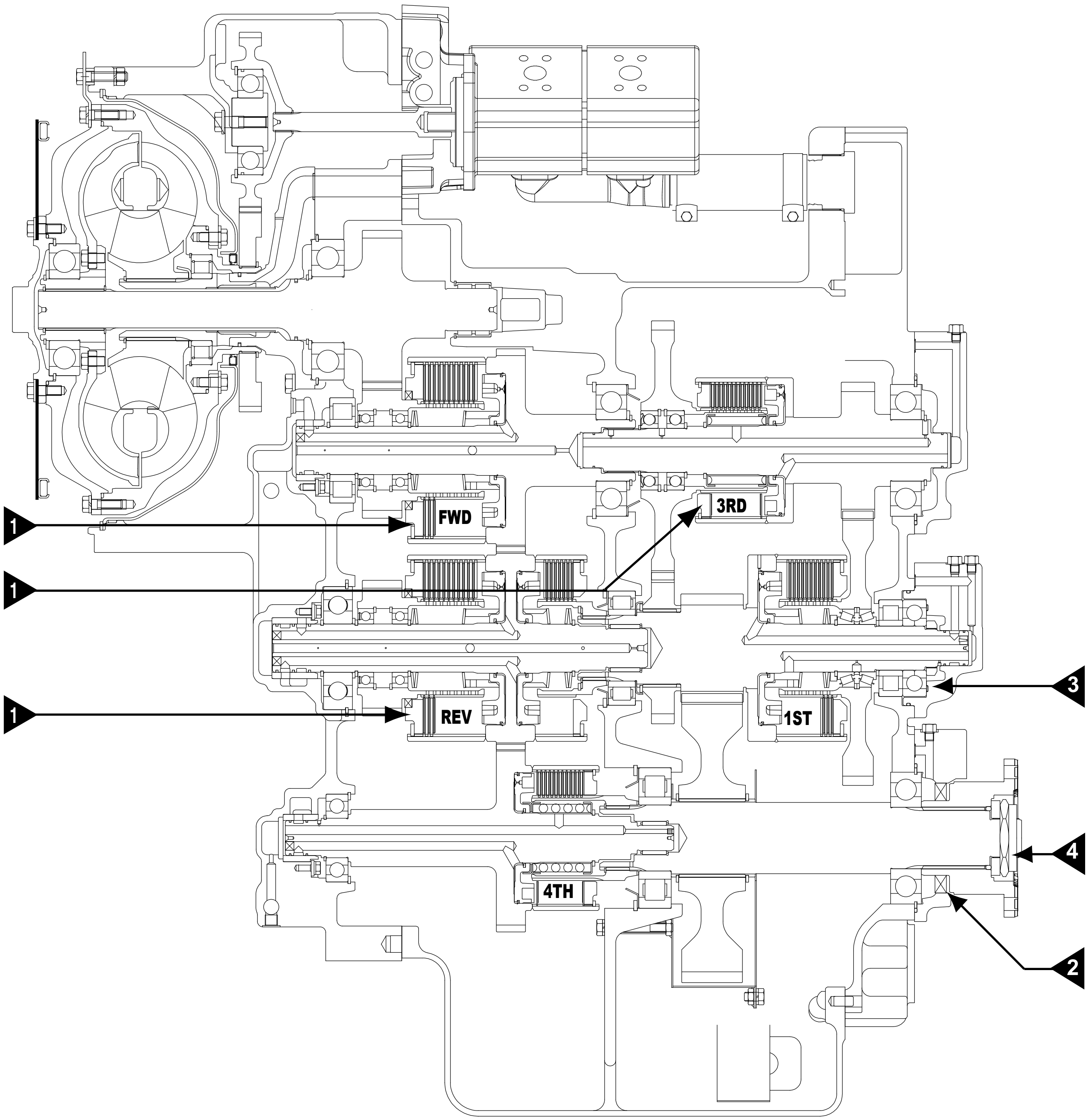


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TE 27/32 REMOTE FILTER ADAPTOR GROUP

Item	Description	Qty
1	Filter	1
2	Adapter - Filter	1
3	Assy - Filter adapter body	1
4	Plug	1
5	Spool - Safety valve	1
6	Plug	1
7	“O” Ring	1
8	Spring	1
9	Plug	2
10	“O” Ring	2
11	Cap - Flange	2
12	“O” Ring	2
13	Capscrew	8
14	Lockwasher	8

9 ASSEMBLY INSTRUCTIONS


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FWD
3RD
REV
1ST
4TH
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All lead-in chamfers for oil seals, pistonrings and 0-rings must be smooth and free from burrs. Inspect at assembly.

Add some grease to 0-rings before assembly.

Add some grease to piston rings before assembly.

Apply a thin coating of grease between seal lips on lip type seals prior to assembly.

Use only precoated pipe plugs. On uncoated pipe plugs apply a light coat of Loctite© 592

Pump must be filled up with oil prior to assembly.

After assembly of parts using Loctite© there must not be any free or excess material which might enter the oil circuit.

Apply a light coat of Loctite© 262 or 270 to all thru hole stud holes.

1 Teflon seals must be sized prior to assembly. Add some grease to seal diameter of clutch hub before assembly.

2 Fwd/Rev Clutch

TE32
11 seperator plates with outer splines.
11 friction plates (friction material on both sides) with inner splines

Clearance Min 6.0mm [0.23in]
Max 6.4mm [0.25in]

TE27
10 seperator plates with outer splines.
10 friction plates (friction material on both sides) with inner splines.

Clearance Min 6.0mm [0.23in]
Max 6.4mm [0.25in]

Use one of the different thickness end plates available to obtain this clearance.

CAUTION

The seperator plates for Fwd and Rev and 1st and 2nd are not the same.
DO NOT MIX PLATES WITH PLATES FROM OTHER CLUTCHES.

3 1st Clutch

TE32
11 seperator plates with outer splines.
11 friction plates (friction material on both sides) with inner splines

Clearance Min 4.35mm [0.17in]
Max 4.75mm [0.19in]

TE27
10 seperator plates with outer splines.
10 friction plates (friction material on both sides) with inner splines.

Clearance Min 4.35mm [0.17in]
Max 4.75mm [0.19in]

Use one of the different thickness end plates available to obtain this clearance.

4 2nd Clutch

TE32

7 seperator plates with outer splines.
7 friction plates (friction material on both sides) with inner splines

Clearance	Min	2.75mm [0.10in]
	Max	3.15mm [0.12in]

TE27

6 seperator plates with outer splines.
6 friction plates (friction material on both sides) with inner splines.

Clearance	Min	2.75mm [0.10in]
	Max	3.15mm [0.12in]

Use one of the different thickness end plates available to obtain this clearance.

5 3rd Clutch

TE32

12 seperator plates with outer splines.
11 friction plates (friction material on both sides) with inner splines
2 1-sided friction plates (friction material on one (1) side) with outer splines.

Clearance	Min	3.5mm [0.14in]
	Max	3.9mm [0.16in]

TE27

6 seperator plates with outer splines.
6 friction plates (friction material on both sides) with inner splines.
2 1-sided friction plates (friction material on one (1) side) with outer splines.

Clearance	Min	3.5mm [0.14in]
	Max	3.9mm [0.16in]

Use one of the different thickness end plates available to obtain this clearance.

6 4th Clutch

TE32

11 seperator plates with outer splines.
10 friction plates (friction material on both sides) with inner splines
2 1-sided friction plates (friction material on one (1) side) with outer splines.

Clearance	Min	3.1mm [0.12in]
	Max	3.5mm [0.14in]

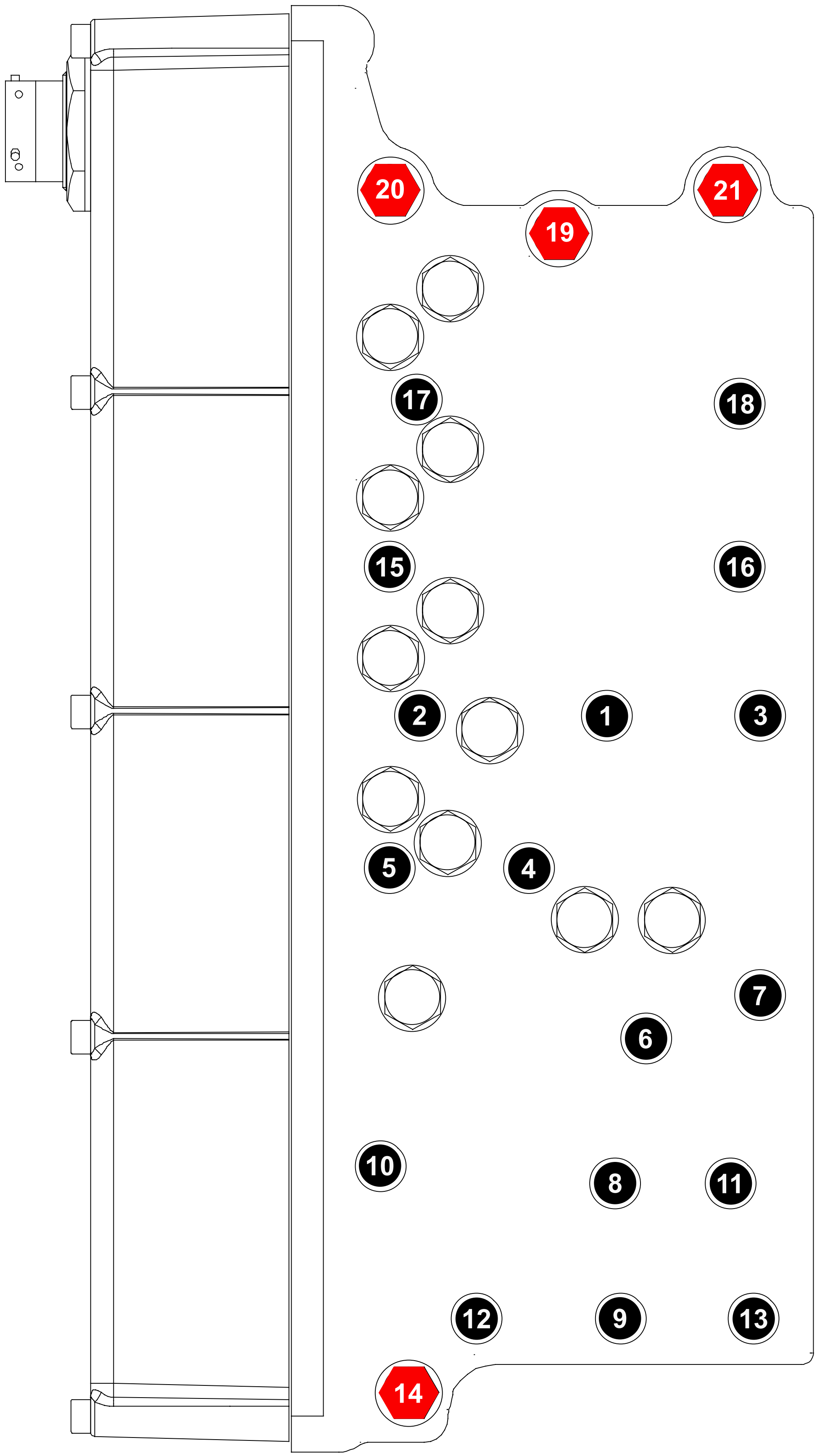
TE27

8 seperator plates with outer splines.
7 friction plates (friction material on both sides) with inner splines.
2 1-sided friction plates (friction material on one (1) side) with outer splines.

Clearance	Min	3.1mm [0.12in]
	Max	3.5mm [0.14in]

Use one of the different thickness end plates available to obtain this clearance.

- **7** Be sure that shielded and sealed bearings are mounted as shown.
- **8** Seals must be pressed in perpendicular upon shaft axis from bearing side.
- **9** Tighten air breather to 31-41 Nm [25-30 Lbs.ft]
- **10** Tighten nut to 145-160 Nm [107-118 Lbs.ft]
- **11** Tighten nut to 339-407 Nm [250-300 Lbs.ft]


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Disassembly of the control valve.
Make sure that the aera oround the valve is clean and that no foreign material can enter the control valve during disassembly. Refer to "Cleaning and Inspection" pages.

Unscrew the 4 hex bolts (marked red with white numbers on the drawing) until you feel that the bolts is loose. **Do not remove the bolt.**

Unscrew the 17 other hex bolts until all hex bolts are handloose. You should be able to move the valve slightly.
Remove 2 hex bolts and replace with aligning studs.
Now remove the remaining loose bolts and remove the valve.

Reinstalling the valve
Using aligning studs install valve and a new gasket. Handtighten all bolts (21 pieces) in the sequence as on the drawing (page 8-6).
Torque all bolts in the same sequence to 20-25 Nm [14.7-18-5Lbs.ft.]

10 DISASSEMBLY AND REASSEMBLY OF TRANSMISSION



Figure 1
Front view of the TE32 Transmission.



Figure 2
Remove flex plate mouting bolts and washers.

(Caution bearing cover may drop.)



Figure 3
Drive plate and backing ring removed.



Figure 4
Remove impeller cover bearing cap and “O” ring.



Figure 5
Remove turbine shaft outer retaining snap ring.



Figure 6
Remove converter assembly bolts.



Figure 7
Use special tool to lift impeller and cover assembly.

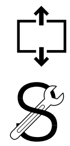




Figure 8
Remove turbine locating ring from turbine shaft.



Figure 9
Remove reaction member retaining snap ring.



Figure 10
Remove reaction member.



Figure 11
Remove reaction member spacer.



Figure 12
Remove oil baffle retaining ring.



Figure 13
An impeller removal tool, like the one shown, can be fabricated to facilitate the removal of the impeller and oil baffle.



Figure 14
Remove pump manifold cap screws and hose clips.



Figure 15
Remove pump manifold cap screws and hose.



Figure 16
Remove pump manifold cap screws.



Figure 17
Remove pump manifold cap screws.

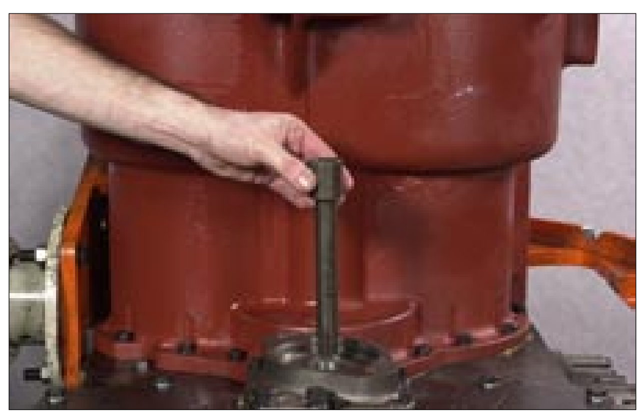


Figure 18
Remove pump drive sleeve.



Figure 19
Remove regulator valve cap screws.



Figure 20
Remove regulator valve and gasket.



Figure 21
Remove pump drive blanking cover plate bolts. (If fitted)



Figure 22
Remove pump drive blanking cover plate and gasket. (If fitted)



Figure 23
Remove stator support bolts and lockawashers.

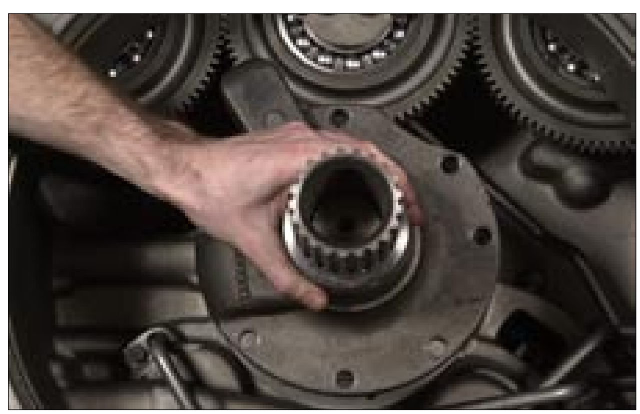


Figure 24
Remove stator support.



Figure 25
Remove pump drive idler gear bolts.



Figure 26
Remove Pump drive idler gear, bearing and support assy.



Figure 27
Remove Pump drive gear bolts (Position A).



Figure 28
Remove Pump drive. (Position A).

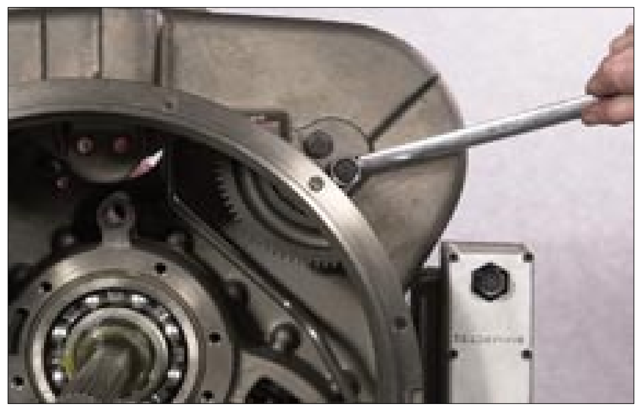


Figure 29
Remove Pump drive gear bolts (Position B).



Figure 30
Remove Pump drive. (Position B).

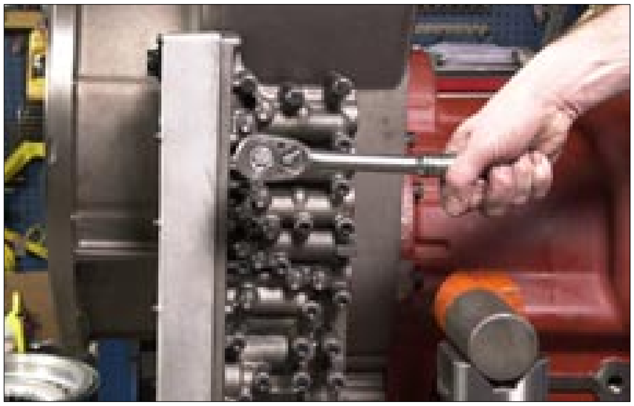


Figure 31
See assembly instructions for disassembly of control valve.



Figure 32
Remove control valve and gasket.



Figure 33
Remove all sensors from converter housing (3).



Figure 34
Remove temperature sensor.



Figure 35
Remove converter housing to transmission case bolts and washers.

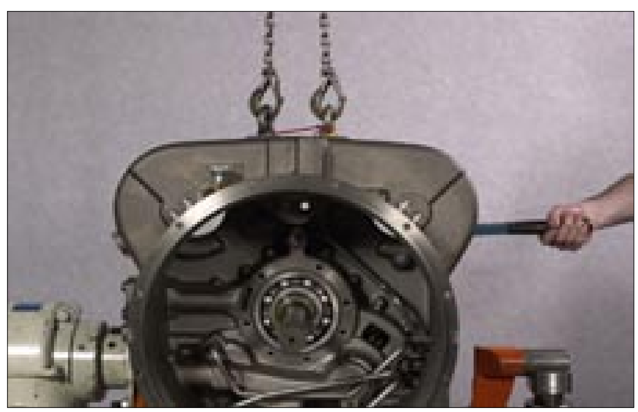


Figure 36
Support converter housing with chain hoist and strap. Use a soft hammer to seperate converter housing from transmission case.



Figure 37
Converter assembly removed.

Note:

REVERSE AND 2NS AND 4TH CLUTCH DRUMWILL RE-MAIN IN THE CONVERTER HOUSING.



Figure 38
Remove snap ring from 2nd clutch hub (Driven gear).



Figure 39
Remove washer from 2nd clutch hub.



Figure 40
Remove inner retaining ring from 2nd clutch hub .



Figure 41
Remove 2nd clutch hub.

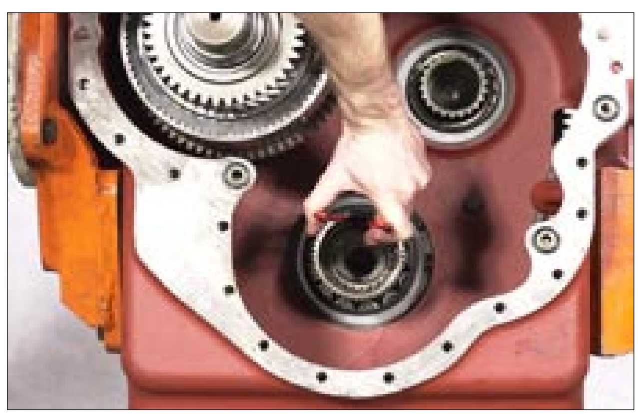


Figure 42
Remove snapring from 4th clutch hub and remove hub.

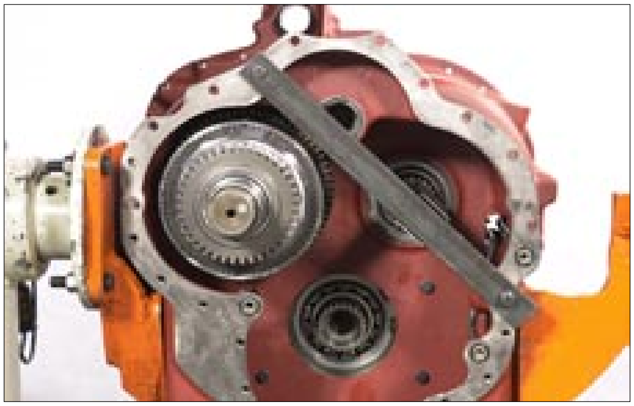


Figure 43
Install special tool to prevent 1st shaft from damaging bearing. (See special tool section)



Figure 44
Using an impact gun remove output flange nut.



Figure 45
Output flange nut, washer and "O" ring removed.



Figure 46
Remove output flange.

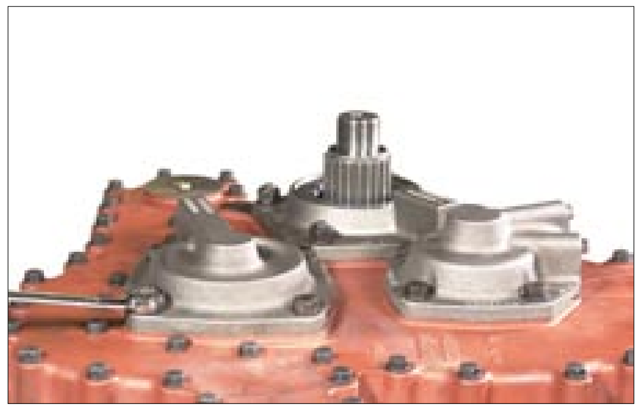


Figure 47
Remove bolts from 3rd clutch shaft rear bearing cap.



Figure 48
Remove 3rd clutch shaft rear bearing cap and "O" ring.



Figure 49
Remove 3rd clutch shaft rear bearing cap locating ring.

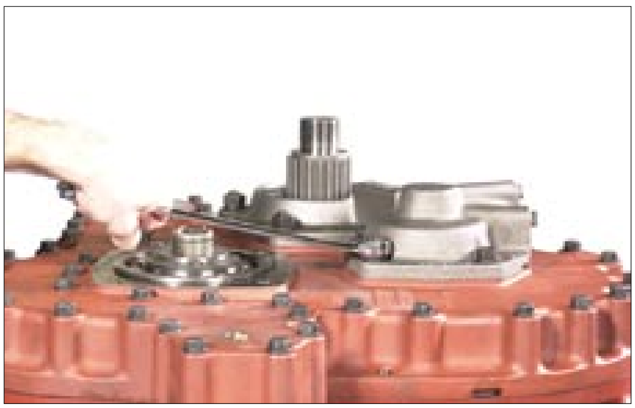


Figure 50
Remove 1st clutch shaft rear bearing cap bolts.

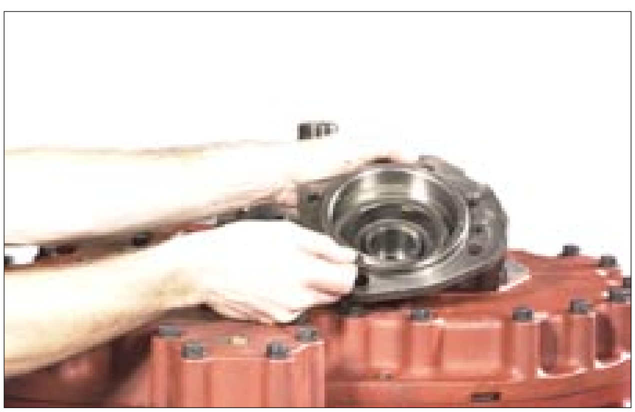


Figure 51
Remove 1st clutch shaft rear bearing cap “O” rings and spring disc.



Figure 52
Remove nuts from output bearing seal and cover assy.

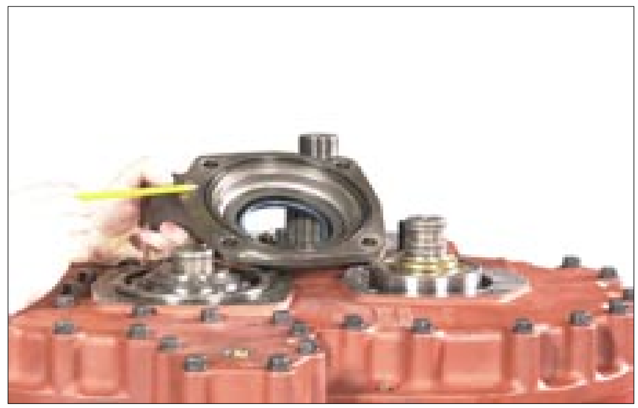


Figure 53
Remove output bearing cover assy.

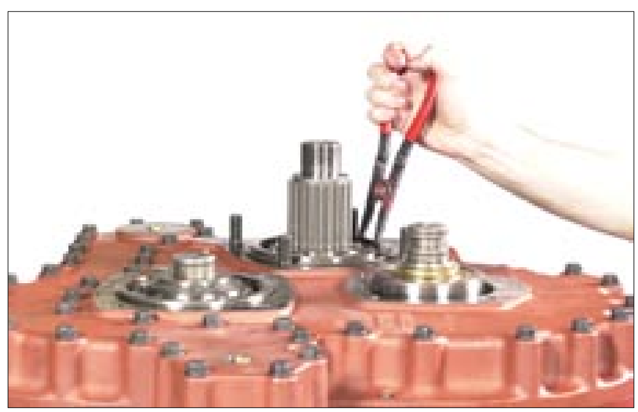


Figure 54
Remove output bearing locating ring.



Figure 55
Remove transmission rear cover bolts.



Figure 56
Use special tool to remove nut from 1st shaft.

See Section 11 “Special Tools”



Figure 57
Remove bearing inner and outer race.



Figure 58
Using a hoist, remove rear cover from transmission case. Tap 3rd/1st shaft with a spoft hammer to assist removal and avoid bending shaft.



Figure 59
Remove snap ring from 3rd shaft bearing.



Figure 60
Remove spacer.



Figure 61
Use a puller to remove 3rd shaft bearing.



Figure 62
Remove baffle plate bolts (3)



Figure 63
Use special tool as shown and remove 1st shaft drum assy and output shaft together as shown.



Figure 64
Whilst hoisting shaft and drum remove baffle plate.

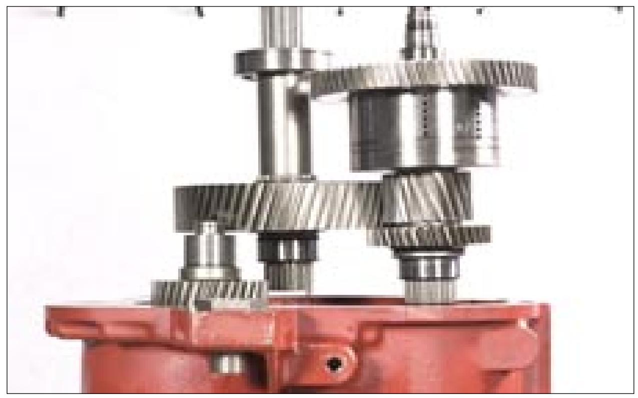


Figure 65
1st shaft drum assy and output shaft assy removed.

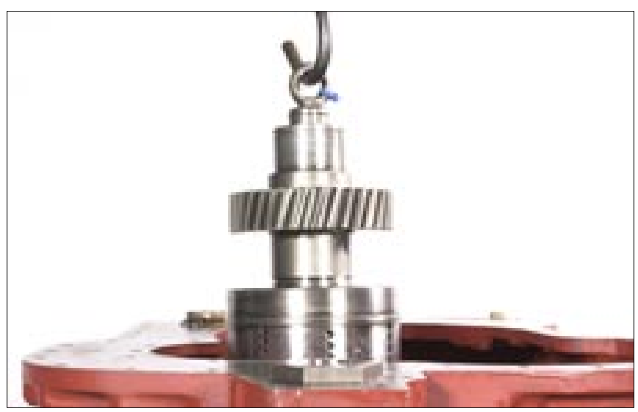


Figure 66
Remove 3rd shaft drum assy.

See also figure 67 before hoisting.



Figure 67
Forward drum assy removed showing snapring and front bearing.(snapring sits under gear and must be removed before forward drum assy can be hoisted.



Figure 68
Remove forward drum assy bearing oil retainer.



Figure 69
Remove 1st shaft drum assy front bearing retaining ring.



Figure 70
Remove 1st shaft drum assy front bearing oil retainer.



Figure 71
Remove 1st shaft drum assy front bearing.



Figure 72
Remove output shaft front bearing snapring.



Figure 73
Remove output shaft front bearing oil retainer.



Figure 74
Remove output shaft front bearing.



Figure 75
Remove turbine shaft bearing snapring.



Figure 76
Remove turbine shaft needle roller bearings (2).



Figure 77
Remove inner baffle plate bolts (3).



Figure 78
Remove suction tube assy bolts.



Figure 79
Remove suction tube assy and “O” ring.



Figure 80
Using external snapring pliers open rev/2nd drum shaft assy bearing retaining ring and remove shaft assy.



Figure 81
Remove 4th drum shaft assy retaining ring.



Figure 82
Remove 4th drum shaft assy.



Figure 83
Remove turbine shaft bearing retaining ring.



Figure 84
Using a soft hammer tap turbine shaft and bearing assy from converter housing.



Figure 85
Pry forward shaft bearing from housing as shown.

Note

Check 3 wear sleeves in converter housing and replace if necessary.

Reverse being disassembled.



Figure 86
Remove piston sealing rings (3).



Figure 87
Remove bearing retaining ring.



Figure 88
Use a bearing puller to remove bearing.



Figure 89
Remove bearing spacer.



Figure 90
Remove clutch gear retainning snapring.



Figure 91
Remove clutch gear and outer bearing as an assembly.



Figure 92
Remove end plate snapring.



Figure 93
Remove end plate and seal assy.



Figure 94
Remove clutch gear inner bearing.



Figure 95
Remove inner and outer discs.



Figure 96
Compress piston return springs and remove spring retaining snapring.

Caution

Force of springs is 3399N



Figure 97
Remove piston return springs.



Figure 98
Remove piston return springs spacer.



Figure 99
Remove reverse clutch piston.

2nd being diassenbled.



Figure 100
Remove 2nd clutch end plate snapring.



Figure 101
Remove 2nd clutch end plate.



Figure 102
Remove inner and outer discs.

Note

The steel discs in FWD/REV and 1st & 2nd are not the same. **DO NOT MIX**



Figure 103
Compress return springs and remove snapring.

Note

Force of disc springs is 2888N



Figure 104
Remove belleville washer disc springs.



Figure 105
Remove clutch piston wear sleeve.



Figure 106
Remove clutch piston.

2nd being reassenbled.



Figure 107
Refer to “Cleaning & Inspection” pages.

The bleed hole in the piston must be clean and free of any foreign material.

Install clutch piston inner seal.

Note

Ring must be sized before installing in clutch drum. Sizing is best accomplished by rotating clutch piston while holding a round object against the new sealing ring.

Rotate piston until seal ring is flush with outer diameter of piston.



Figure 108
Install clutch piston outer seal.

Note

See figure 105 for sizing.



Figure 109
Install clutch piston wear sleeve.



Figure 110
Install piston return springs.

First spring with large diameter of bevel towards wear sleeve. See figure 110

Alternate 7 springs.

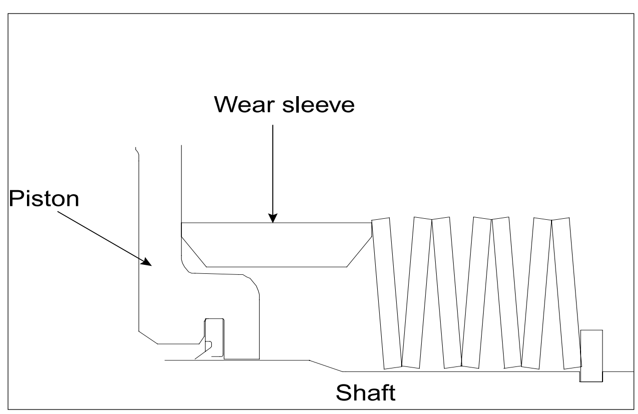


Figure 111



Figure 112
Compress spring and install spring retaining snap-ring.

Note

Be sure ring is in full position in groove.



Figure 113
Install clutch pack discs into drum. Start with one steel disc against piston. Alternate friction and steel discs until proper amount are installed. Last disc is friction disc.



Figure 114
Install end plate.



Figure 115
Install end plate retaining ring.

2nd being reassenbled



Figure 116
Refer to “Cleaning & Inspection” pages.

The bleed hole in the piston must be clean and free of any foreign material.

Install clutch piston inner seal. Size as described in figure 106.



Figure 117
Install clutch piston outer seal.

Note

See figure 107 for sizing.



Figure 118
Install clutch piston in drum as shown.

Use caution as not to damage inner and outer piston sealing rings.



Figure 119
Install clutch piston wear sleeve.



Figure 120
Install clutch piston return disc springs. First spring with large diameter of bevel towrds wear sleeve. Alternate fifteen (15) springs.

See figure 121.

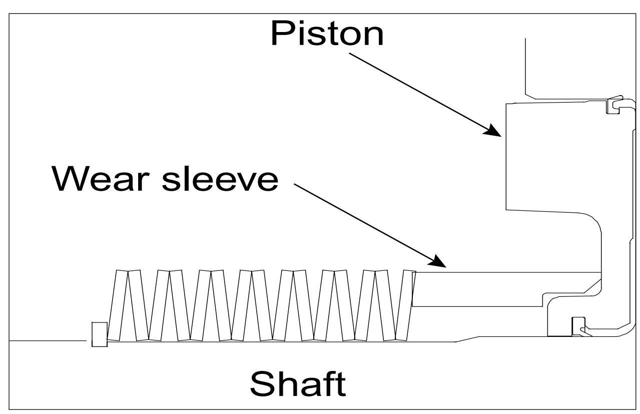


Figure 121



Figure 122
Compress spring and install retaining ring.

Note

Make sure ring is in full position in groove.



Figure 123
Install one (1) steel disc into drum. Alternate friction and steel discs until proper amount of discs is installed. First and last disc are steel.



Figure 124
Install new seal in end plate.



Figure 125
Install install end plate in drum and fit end plate retaining ring.



Figure 126
Warm inner bearing to 120° C [248° F] and install bearing on shaft.



Figure 127
Install two (2) bearing retaining rings in clutch gear and install clutch gear and hub into clutch drum. Align splines on clutch hub with internal teeth of frintion discs. Tap gear into position. **Do not force this operation**. Gear splines must be aligned with internal teeth of all friction discs.



Figure 128
Warm outer bearing to 120° C [248° F] and install bearing on shaft.



Figure 129
Install bearing snapring.



Figure 130
Install outer bearing thrust washer.



Figure 131
Warm outer bearing to 120° C [248° F] and install bearing on shaft with groove down as shown.



Figure 132
Install bearing snapring.



Figure 133
Install three (3) clutch shaft piston rings.



Figure 134
Remove bearing snap ring.



Figure 135
Remove bearing spacer.



Figure 136
Remove bearing.



Figure 137
Remove Remove large snapring from shaft.



Figure 138
Remove two (2) piston seal rings.



Figure 139
Remove bearing snap ring.



Figure 140
Remove bearing inner race.



Figure 141
Remove retaining ring.



Figure 142
Use a puller and remove clutch gear and outer bearing.



Figure 143
Remove end plate retaining ring.



Figure 144
Remove end plate.



Figure 145
Remove inner and outer clutch discs.



Figure 146
Remove inner bearing.



Figure 147
Compress return spring and remove snapring.

Note

Force of disc spring is 3381N



Figure 148
Remove return spring pack.



Figure 149
Remove clutch piston wear sleeve.



Figure 150
Remove clutch piston.



Figure 151
Refer to “Cleaning & Inspection” pages.

The bleed hole in the piston must be clean and free of any foreign material.

Install clutch piston inner seal.

See note figure 59.



Figure 152
Install clutch piston outer seal.

See note figure 59.



Figure 153
Install clutch piston wear sleeve.



Figure 154
Install clutch piston return disc springs. First spring with large diameter of bevel towards wear sleeve. Alternate fifteen (15) springs.

See figure 155

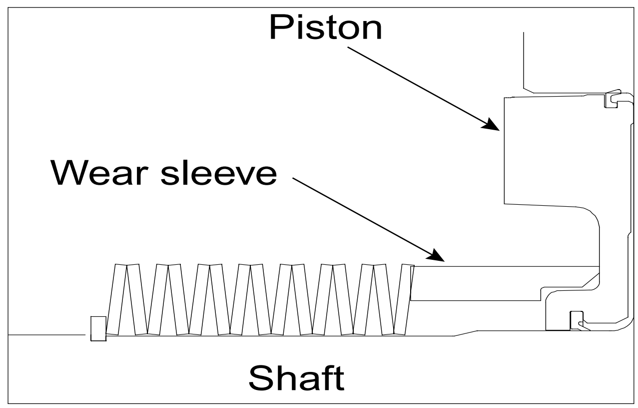


Figure 155



Figure 156
Compress spring and install snapring.



Figure 157
Install one steel disc. Alternate friction and steel disc until proper amount of discs is installed.

First and last disc are steel.



Figure 158
Install new seal in end plate and install plate.



Figure 159
Install end plate retaining ring.



Figure 160
Warm outer bearing to 120° C [248° F] and install bearing on shaft.



Figure 161
Install two (2) bearing locating rings in clutch gear and install clutch gear into clutch drum. Align splines on clutch hub with internal teeth of steel discs. Tap gear into position.

See note figure 127



Figure 162
Warm outer bearing to 120° C [248° F] and install bearing on shaft.



Figure 163
Install bearing snapring.



Figure 164
Install bearing inner race.



Figure 165
Install bearing retainig ring.



Figure 166
Install two (2) piston rings.



Figure 167
Install retaining ring over shaft before fitting bearing.



Figure 168
Warm outer bearing to 120° C [248° F] and install bearing on shaft with groove down as shown.



Figure 169
Install bearing spacer.



Figure 170
Install snapring.



Figure 171
Remove one (1) piston ring.



Figure 172
Remove clutch gear bearing retaining ring.



Figure 173
Remove 3rd clutch driven gear and bearing.



Figure 174
Remove spacer.



Figure 175
Remove end plate retainnig ring.



Figure 176
Remove end plate.



Figure 177
Remove inner and outer discs.



Figure 178
Compress spring and remove snapring.



Figure 179
Remove spring and spring retainer.



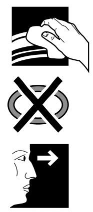
Figure 180
Remove spring retainer.



Figure 181
Remove clutch piston.



Figure 182
Refer to “Cleaning & Inspection” pages.



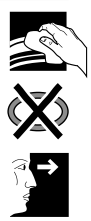
The bleed hole in the piston must be clean and free of any foreign material.

Install clutch piston inner seal.

See note figure 59.



Figure 183
Install clutch piston outer seal. And install piston into drum.



See note figure 59.



Figure 184
Install piston spacer.



Figure 185
Install piston return spring.



Figure 186
Install piston return spring retainer.



Figure 187
Compress spring and Install piston return spring retainer retaining ring.



Figure 188
Install half disc (friction material on one side) with steel side down.



Figure 189
Install one steel disc. Alternate friction and steel disc until proper amount of discs are installed. First and last disc are steel.



Figure 190
Install half disc (friction material on one side) with steel side up.



Figure 191
Install clutch disc end plate.



Figure 192
Install clutch disc end plate retaing ring.



Figure 193
Install spacer.



Figure 194
Heat gear and bearing assy to 120° C [248° F] and install gear. Align splines on clutch hub gear with internal teeth of friction discs. **Do not force this operation**. Gear splines must be in full position with internal teeth of all inner discs.



Figure 195
Install bearing retaining ring.



Figure 196
Install piston ring.



Figure 197
Install piston ring.



Figure 198
Remove piston sealing rings.



Figure 199
Remove bearing snap ring.



Figure 200
Using a puller as shown, remove bearing from shaft.



Figure 201
Remove retaining snapring from shaft.



Figure 202
Remove end plate retaining ring.



Figure 203
Remove end plate.



Figure 204
Remove inner and outer clutch plates.



Figure 205
Remove Compress spring and remove snapring.



Figure 206
Remove spring retainer and spring.



Figure 207
Remove spacer.



Figure 208
Remove clutch piston.



Figure 209
Refer to “Cleaning & Inspection” pages.

The bleed hole in the piston must be clean and free of any foreign material.

Install clutch piston inner seal.

See note figure 59.



Figure 210
Install clutch piston outer seal. And install piston into drum.

See note figure 59.



Figure 211
Install spacer.



Figure 212
Install spring and spring retainer.



Figure 213
Compress spring and install spring retaing snapring.



Figure 214
Install one (1) half disc (friction material on one (1) side) steel side down.



Figure 215
Install one (1) friction disc. Alternate steel and froction plates until proper amount of discs are installed.



Figure 216
Install one (1) half disc (friction material on one (1) side) steel side up.



Figure 217
Install end plate.



Figure 218
Install end plate retaining ring.



Figure 219
Install snapring over shaft (to be used when installing drum/shaft in casing.)



Figure 220
Warm bearing to 120°C [248° F] and install on shaft.



Figure 221
Install bearing retaining snap ring.



Figure 222
Install piston rings.



Figure 223
Remove piston rings.



Figure 224
Using a puller remove gear, bearing, bearing outer race and spacer as an assembly.



Figure 225
Remove bearing spacer.



Figure 226
Remove end plate retaining ring.



Figure 227
Remove end plate.



Figure 228
Remove inner and outer clutch plates.



Figure 229
Using a bearing puller remove lower hub taper roller bearing from shaft.



Figure 230
Compress piston return spring and remove piston return spring snapring.



Figure 231
Remove spring retaining ring.



Figure 232
Remove piston return spring pack.



Figure 233
Remove piston return spring spacer.



Figure 234
Remove clutch piston.



Figure 235
Turn shaft and remove outer bearing race from shaft.



Figure 236
Remove snapring shield.



Figure 237
Remove snapring.



Figure 238
Remove gear.



Figure 239
Refer to “Cleaning & Inspection” pages.

The bleed hole in the piston must be clean and free of any foreign material.

Install clutch piston inner seal.

See note figure 59.



Figure 240
Install clutch piston outer seal. And install piston into drum.

See note figure 59.



Figure 241
Install wear sleeve.



Figure 242
Install clutch piston return disc springs. First spring with large diameter of bevel towards wear sleeve. Alternate nine (9) springs.

See figure 243

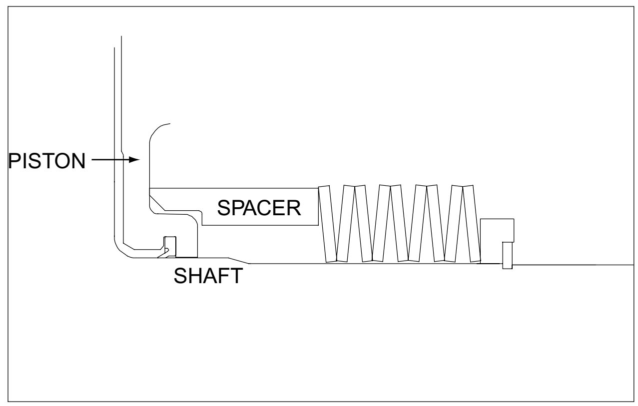


Figure 243



Figure 244
Install clutch piston return disc springretainer.

Make sure return spring retainer is fitted with stepped groove up.

TE32 REASSEMBLY OF 1ST CLUTCH



Figure 245
Compress return spring and install return spring retainer. Make sure retaining ring is in full contact in groove.



Figure 246
Install one (1) friction disc. Alternate steel and froction plates until proper amount of discs are installed.



Figure 247
Install end plate.



Figure 248
Install end plate retaining snapring.



Figure 249
Warm taper bearing to 120° C [248° F] and install on shaft.



Figure 250
Install bearing spacer.



Figure 251
Install clutch driven gear and hub assembly.

Align splines on clutch gear hub with internal splines of friction discs. **Do not force this operation**. Gear splines must be in full position with internal teeth of all inner discs.



Figure 252
Warm taper bearing to 120° C [248° F] and install on shaft.



Figure 253
Install bearing spacer.



Figure 254
Warm bearing race to 120° C [248° F] and install on shaft.



Figure 255
Install piston sealing rings.



Figure 256
Turn shaft and install gear.



Figure 257
Install gear retaing snap ring.



Figure 258
Install gear retaing snap ring shield.



Figure 259
Warm bearing race to 120° C [248° F] and install on shaft.



Figure 260
Using a puller remove bearing from shaft.



Figure 261
Turn shaft and Using a puller remove bearing inner race from shaft.



Figure 262
Remove snapring.



Figure 263
Remove gear.



Figure 264
Remove snapring.



Figure 265
Install snapring.



Figure 266
Install gear.



Figure 267
Install snapring.



Figure 268
Heat bearing inner race to 120°C [248°F] and install on shaft.



Figure 269
Heat bearing inner race to 120°C [248°F] and install on shaft.



Figure 270
Remove piston sealing ring.



Figure 271
Remove bearing retaining ring.



Figure 272
Remove spacer.



Figure 273
Use a hydraulic press to remove bearing.



Figure 274
Warm bearing to 120°C [248°F] and install on shaft. Note that retaining ring groove is up.



Figure 275
Install spacer.



Figure 276
Install snapring.



Figure 277
Install piston sealing ring.



Figure 278
Remove impellor hub gear retaining ring.



Figure 279
Remove impellor hub gear.



Figure 280
Remove oil baffle from impellor hub.



Figure 281
Remove impellor hub bolts.



Figure 282
Remove impellor hub backing ring.



Figure 283
Remove impellor from impellor hub.



Figure 284
Remove impellor from impellor hub.



Figure 285
Remove impellor hub bearing retaining ring.



Figure 286
Remove impellor hub bearing.



Figure 287
Install impellor hub bearing.



Figure 288
Install impellor hub bearing retaining ring.



Figure 289
Position new impellor hub O-ring on hub.



Figure 290
Position impellor hub O-ring on hub.



Figure 291
Position impellor hub bolt backing ring.



Figure 292
Make sure that hub mounting surface and tapped holes are cleaned with solvent. Install self locking screws and tighten to 58 - 64 Ft.lns [79-87 Nm]

Note:

Assembly of hub must be completed within a fifteen minute period from start of screw installation. The special screw is to be used for one (1) installation only. If the screw is removed for any reason, it must be replaced. The epoxy left in the hub holes must be removed with the proper tap and the hole must be cleaned with solvent. Dry the holes thoroughly and use a new screw for reinstallation.



Figure 293
Apply a light coat of Loctite© 638 to the outer diameter of the oil baffle oil seal, press oil seal in oil baffle wit lip of seal down. Install oil baffle O-ring.



Figure 294
Install impeller hub gear.



Figure 295
Install impeller hub gear retaining ring.



Figure 296
Remove turbine hub front bearing retaining ring.



Figure 297
Remove turbine hub front bearing washer.



Figure 298
Tap turbine hub from impeller cover.



Figure 299
Remove turbine hub bolts and lock tabs.



Figure 300
Align holes in turbine and turbine hub. Position lock tabs and install bolts. Tighten bolts to specified torque ‘See torque chart). Bend a corner of the lock tab over a flat of the bolt heads. See figure 301.

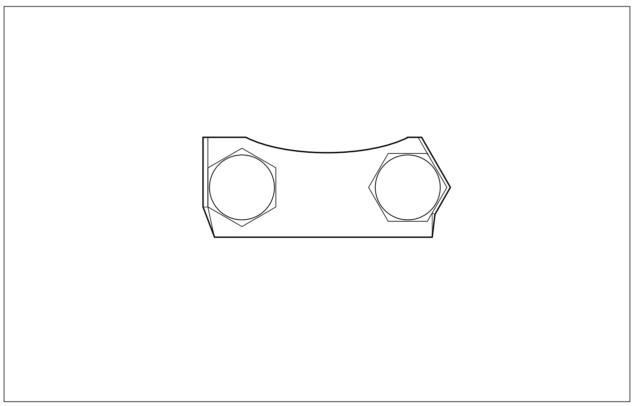


Figure 301



Figure 302
Center impeller cover over turbine hub. Install impeller cover bearing in impeller cover and over turbine hub. Tap bearing into place.



Figure 303
Install washer.



Figure 304
Install bearing retaing snapring.



Figure 305
Remove snapring.



Figure 306
Remove bearing.



Figure 307
Remove support.



Figure 308
Press support into bearing and install assembly into gear.



Figure 309
Install bearing snapring.

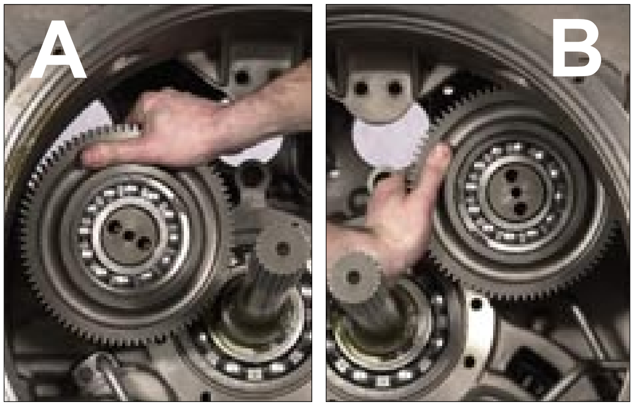


Figure 310
Install outer pump drive gear assemblies (Left and right). Put new 0-rings (4) on bolts, install bolts and tighten to specified torque (See torque chart).

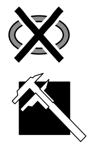




Figure 313
From the rear of the housing tap turbine shaft and bearing in converter housing. Tap shaft until gear shoulders is against converter housing.



Figure 311
Install center pump drive gear assembly. Tighten bolts to specified torque.



Figure 314
From the front of the housing, install turbine shaft bearing locating ring. Tap shaft until ring is in full position in groove.



Figure 312
Install 4th speed outer roller bearing in converter housing.

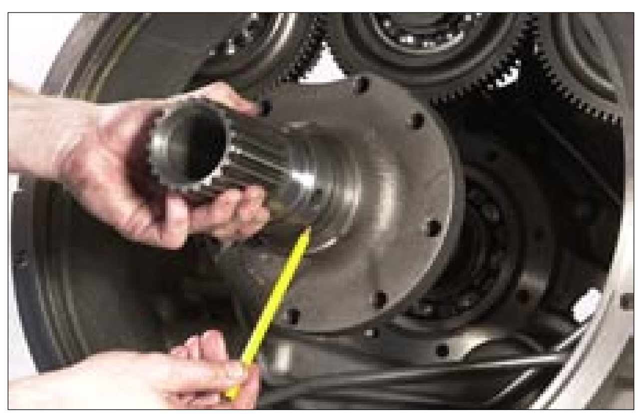


Figure 315
Install new O-ring on stator support. Position stator support on turbine shaft. Turn stator support to clear pump drive gear. Align support holes with converter housing.



Figure 316
Install stator support nolts and washers and tighten bolts to specified torque.



Figure 317
Spread ears on snapring and install 2nd/Rev clutch drum assembly into converter housing.



Figure 318
Install 4th shaft and drum assy into converter housing.



Figure 319
Install 4th shaft and drum assembly snap ring.



Figure 320
Install needle roller bearings on 2nd/Rev and 4th shafts.



Figure 321
Install suction tube and "O" ring into transmission case.



Figure 322
Install suction tube bolts and washers and tighten to specified torque. (See torque chart)



Figure 323
Install oil baffle plate and spacers (3). Add Loctite® 262 to bolts threads and install from other side of transmission. Torque to specified torque. (See torque chart)



Figure 324
Install output shaft bearing and oil retainer. See figure 325.

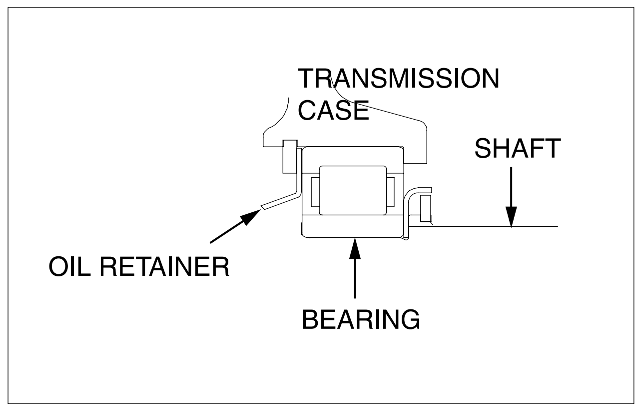


Figure 325

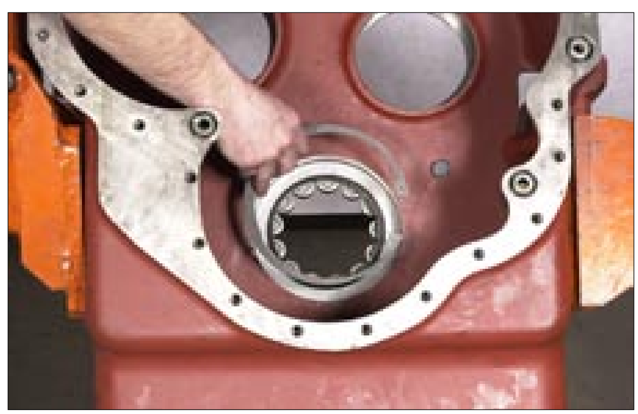


Figure 326
Install output shaft and oil retainer snapring.



Figure 327
Install 1st clutch shaft bearing.



Figure 328
Install 1st clutch shaft oil retainer.

See figure 328.

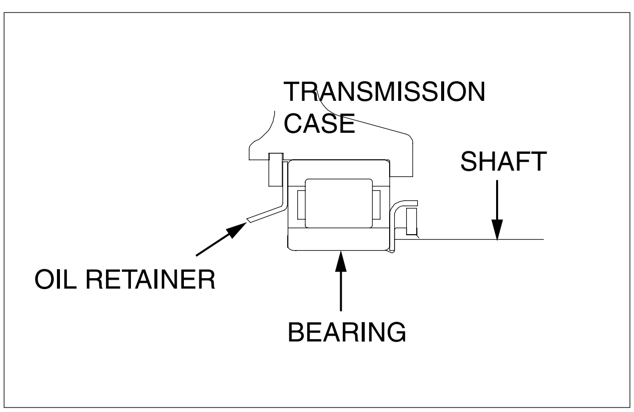


Figure 329



Figure 330
Install 1st clutch shaft bearing snap ring.



Figure 331
Install fwd shaft bearing oil retainer.

See figure 332.

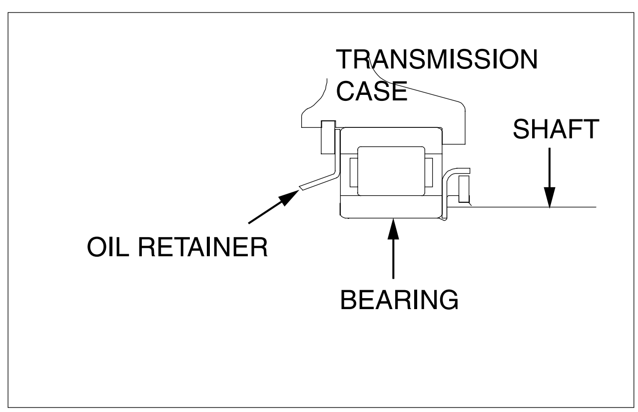


Figure 332



Figure 333
Install 3rd clutch and drum as an assembly.



Figure 334
Install special tool as shown.



Figure 335
Using special tool, install output shaft and 1st clutch assembly.



Figure 336
Warm 3rd shaft bearing to 120° C [248° F] and istall on shaft with snap ring groove up.



Figure 337
Install bearing spacer



Figure 338
Install bearing snapring.



Figure 339
Install transmission case to rear cover new gasket and "O" rings (3).



Figure 340
Install 2 aligning studs and install transmission case rear cover.



Figure 341
Install rear cover to transmission case bolts and tighten to specified torque.

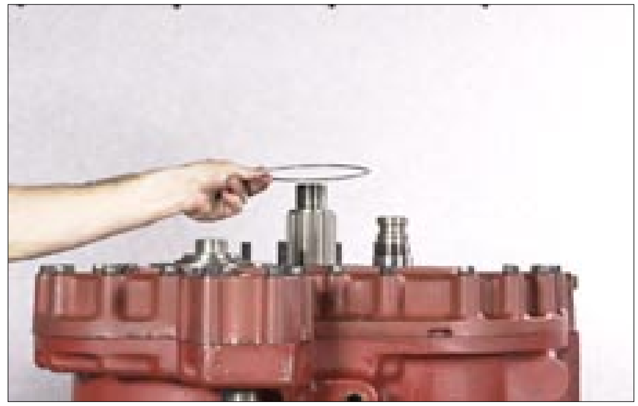


Figure 342
Raise output shaft slightly and install bearing retaining ring.

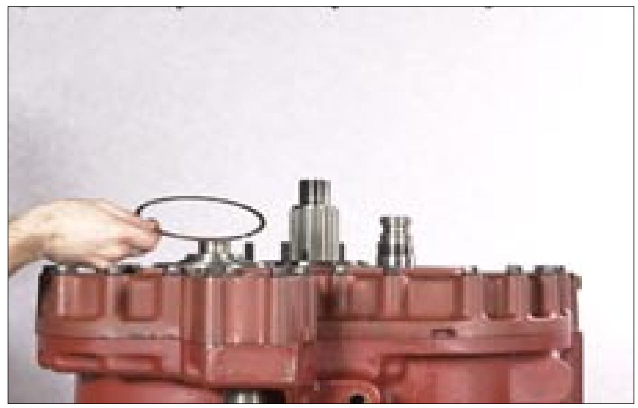


Figure 343
Raise 3rd shaft slightly and install bearing retain-ing ring.



Figure 344
Install ball bearing assembly onto 1st shaft.



Figure 345
Install lock nut on 1st shaft.



Figure 346
Using special tool torque lock nut to 145-160 Nm [107-118 Lbs.ft].



Figure 347
Fit new seal and “O” ring to output shaft bearing cap and install cap.

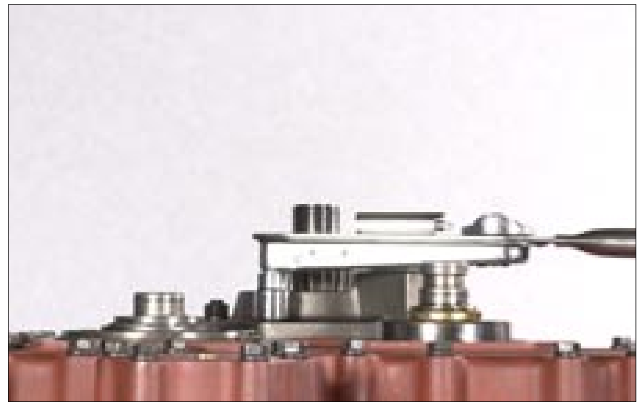


Figure 348
Install nuts and lockwashers to bearing cap and tighten to specified torque. See torque chart.



Figure 349
Fit new seal and “O” ring to 3rd shaft bearing cap and install cap.

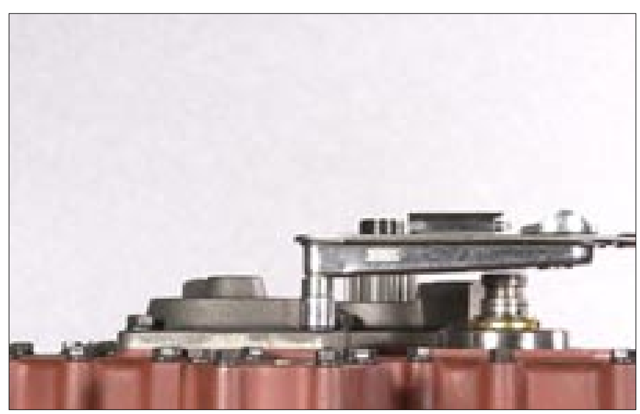


Figure 350
Install nuts and lockwashers to bearing cap and tighten to specified torque. See torque chart.



Figure 351
Install 1st shaft bearing cap with new “O” rings (3) and spring disc.



Figure 352
Install bolts and lockwashers to bearing cap and tighten to specified torque. See torque chart.

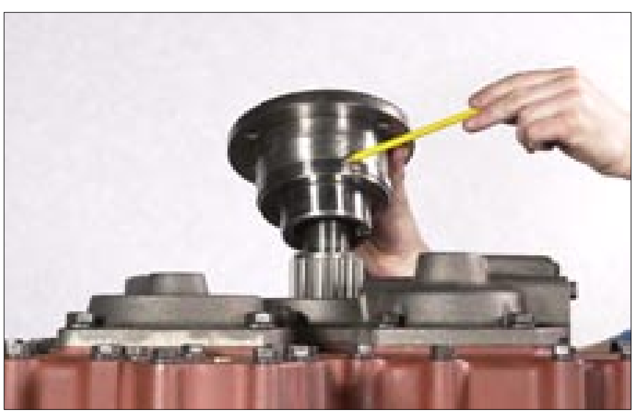


Figure 353
Install new oil seal on output flange and install flange on shaft.



Figure 354
Install output flange “O” ring, washer and nut.

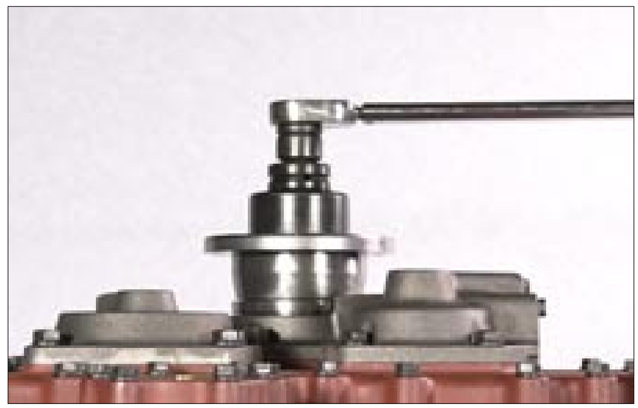


Figure 355
Tighten output flange nut to 339-407 Nm [250-300 Lbs.ft]

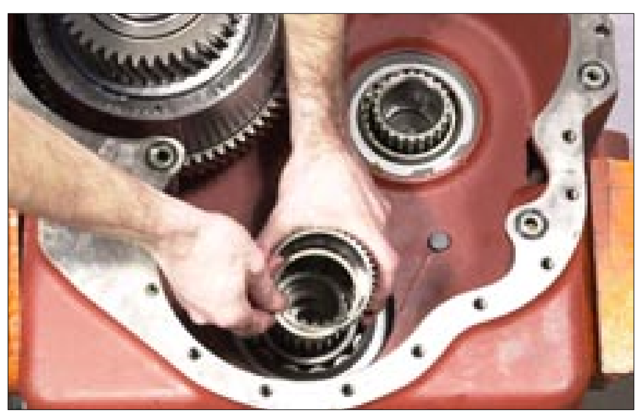


Figure 356
Install 4th clutch hub and snapring.



Figure 357
Install 2nd clutch hub.



Figure 358
Install 2nd clutch hub retaining ring, spacer and snapring.



Figure 359
Install new converter housing to transmission case gasket and new “O” rings (3).



Figure 360
Install alignment studs and position converter housing assembly on on studs.

Note:

Turning output shaft will assist in aligning clutch hubs with clutch assembly.

Install converter housing to transmission housing bolts and lockwashers and tighten to specified torque. See torque chart.

Caution

Bolts are not to be used to pull converter and transmission housing together.

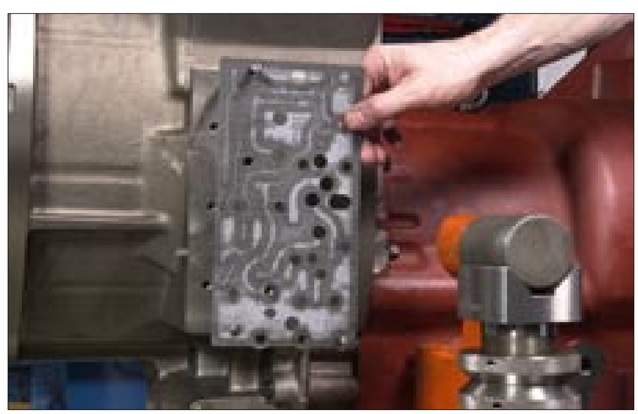


Figure 361
Install aligning studs and install new valve gasket.

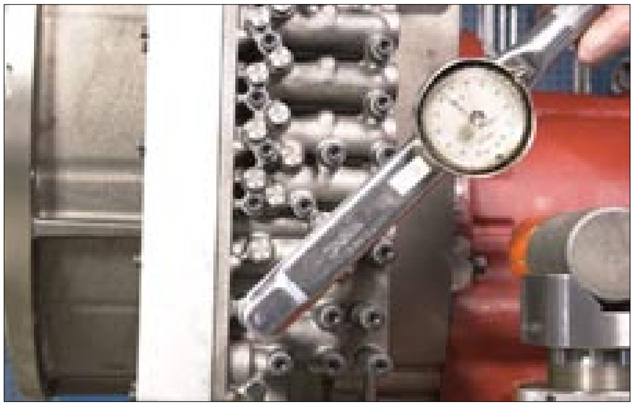


Figure 362
Install control valve. See assembly instructions.



Figure 363
Install regulator valve and new gasket to converter housing.



Figure 364
Install capscrews and torque to specified torque. See torque chart.



Figure 365
Install pump drive shaft.



Figure 366
With new “O” ring in place, install pump assembly.



Figure 367
Install pump capscrews and lockwashers and tighten to specified torque. See torque chart.



Figure 368
Install pump manifold and hose, fitting new “O” rings if required.

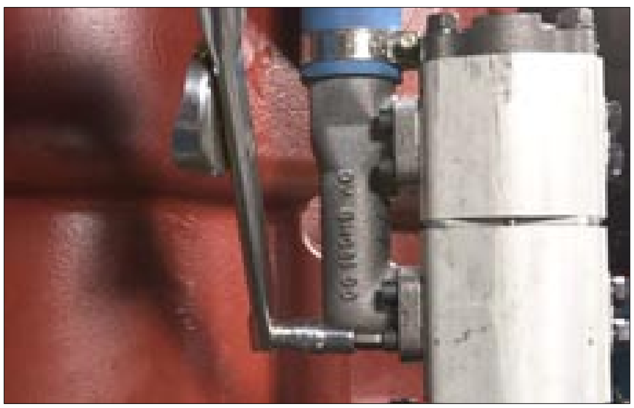


Figure 369
Install capscrews and lockwashers and torque to specified torque. See torque chart.

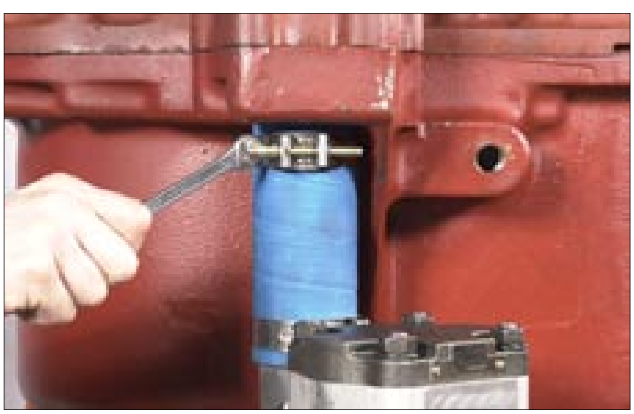


Figure 370
Tighten clips on suction hose.



Figure 371
Install pump drive shipping covers (if fitted) and install bolts and lockwashers. Tighten to specified torque. See torque chart.



Figure 372
Install impeller and oil baffle assembly.



Figure 373
Install impeller hub bearing inner race.



Figure 374
Using a soft drive tap oil baffle down to seat correctly.



Figure 375
Install oil baffle retaing ring. Make sure retaining ring is in full contact in grrove.



Figure 376
Install reaction member spacer.



Figure 377
Install reaction member with thin side of blades inwards to impeller.



Figure 378
Install reaction member snapring.



Figure 379
Install turbine hub rear retaining snapring on shaft.



Figure 380
Position new “O” ring on impeller cover and install cover and turbine assembly on shaft.



Figure 381
Install impeller cover bolts and lockwashers and tighten to specified torque. See torque chart.



Figure 382
Install turbine retaining snapring.



Figure 383
Install new “O” ring on bearing cap and install cap.



Figure 384
Position flex plates on turbine cover.



Figure 385
Position flex plates backing ring.



Figure 386
Install flex plate mounting bolts and lockwashers and tighten to specified torque.

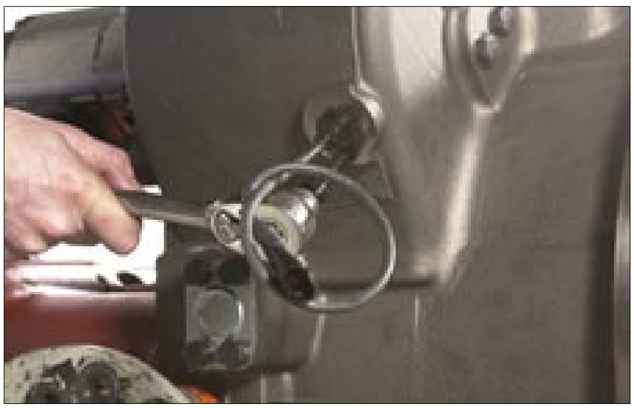
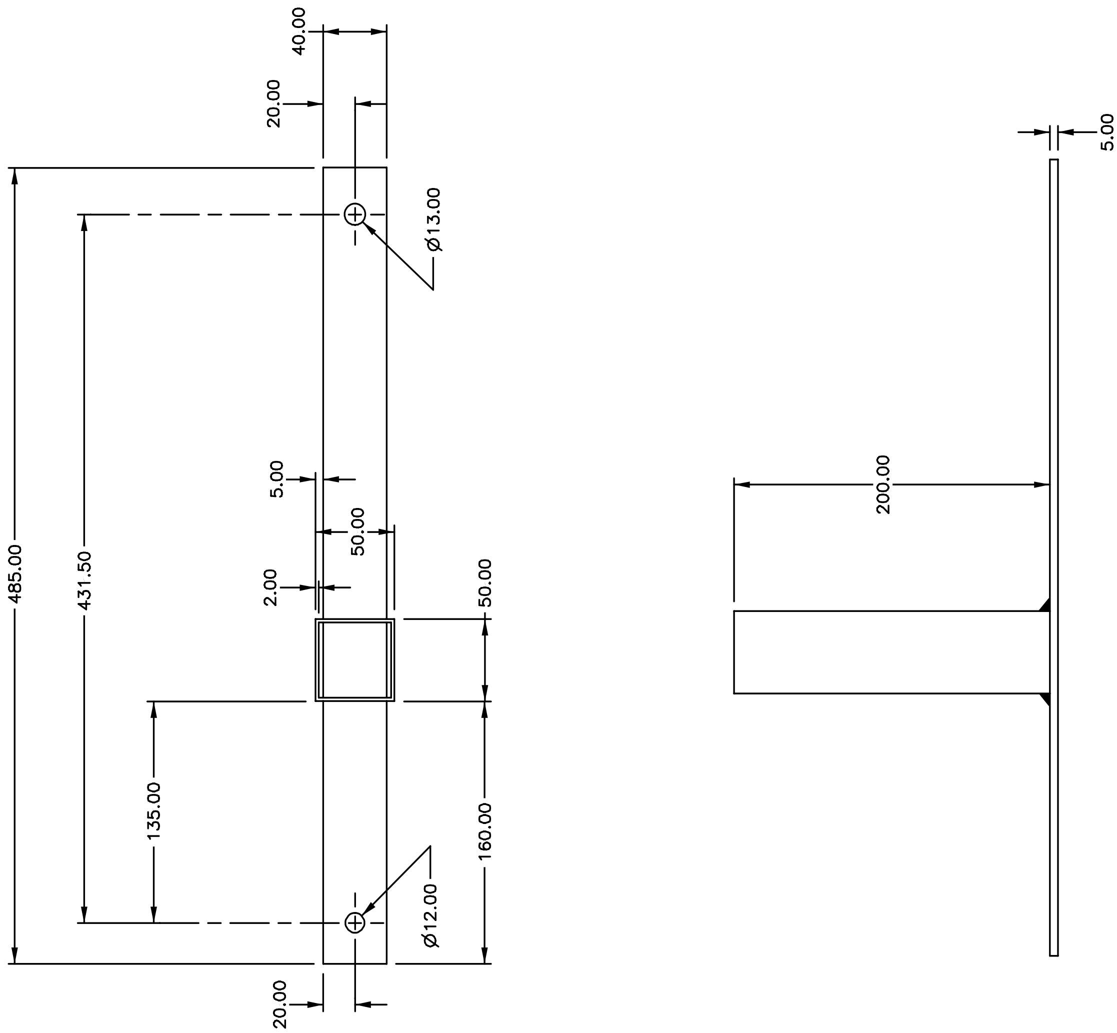


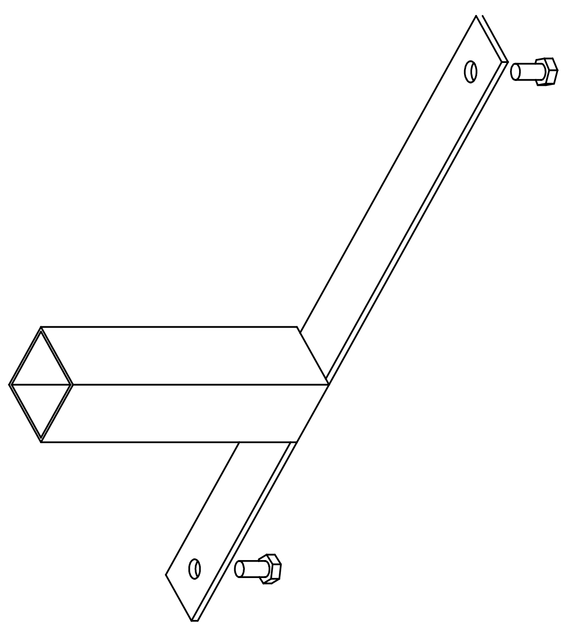
Figure 387
Install speed sensors (3).

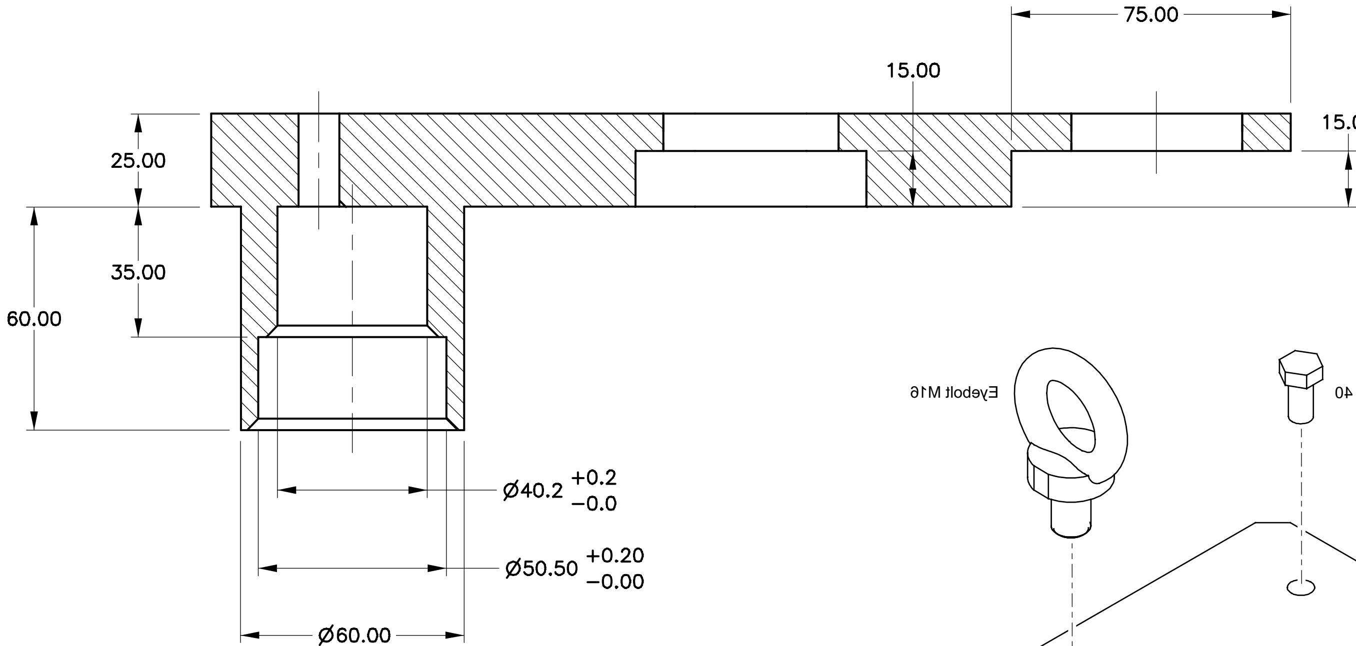


Figure 388
Install temperature sensor.

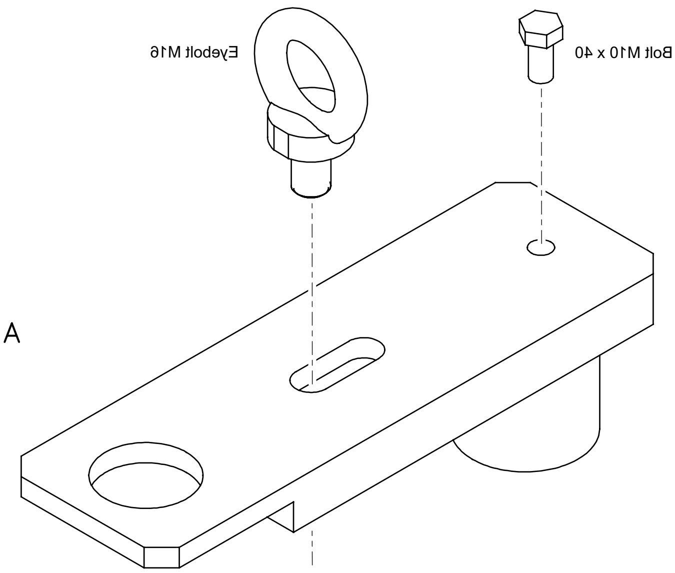
11. SPECIAL TOOLS

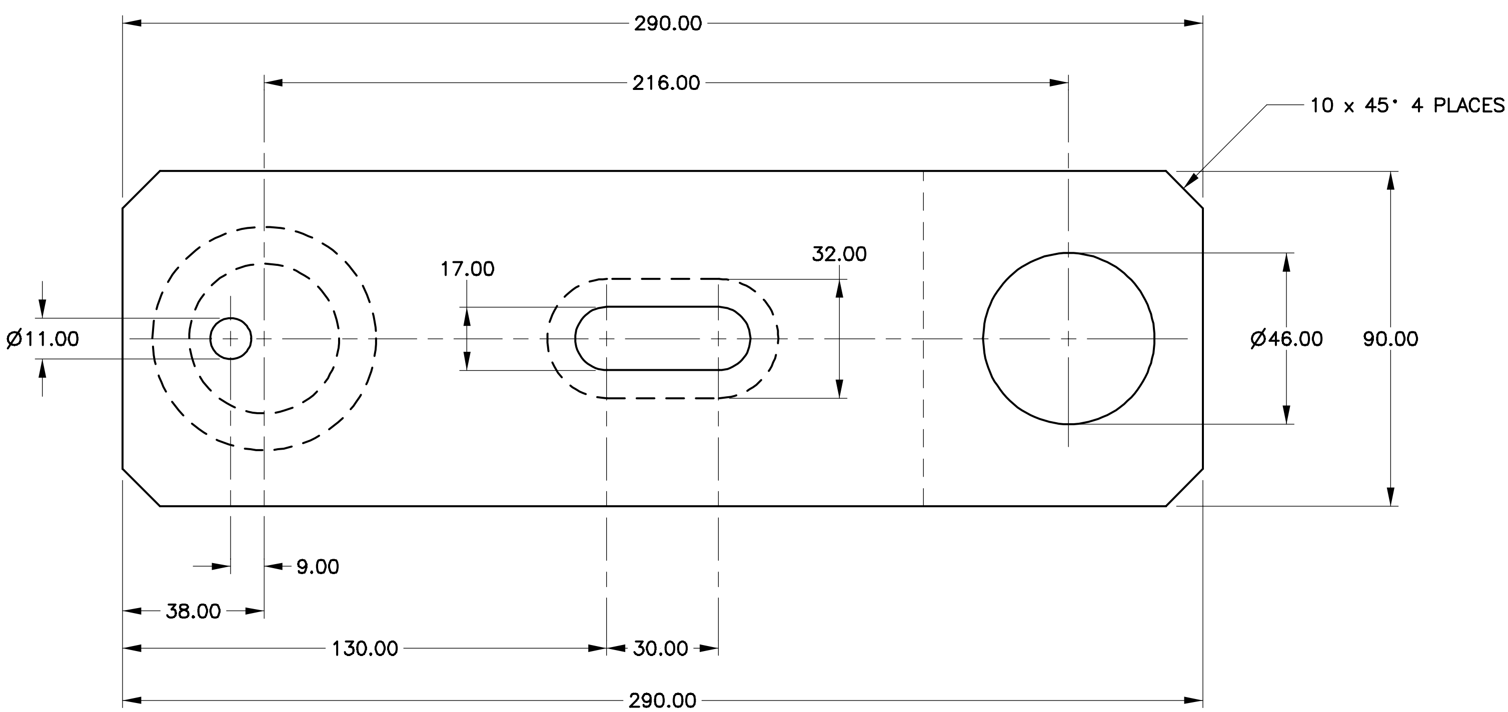

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20.00
5.00
Ø13.00
485.00
431.50
5.00
50.00
2.00
50.00
200.00
135.00
160.00
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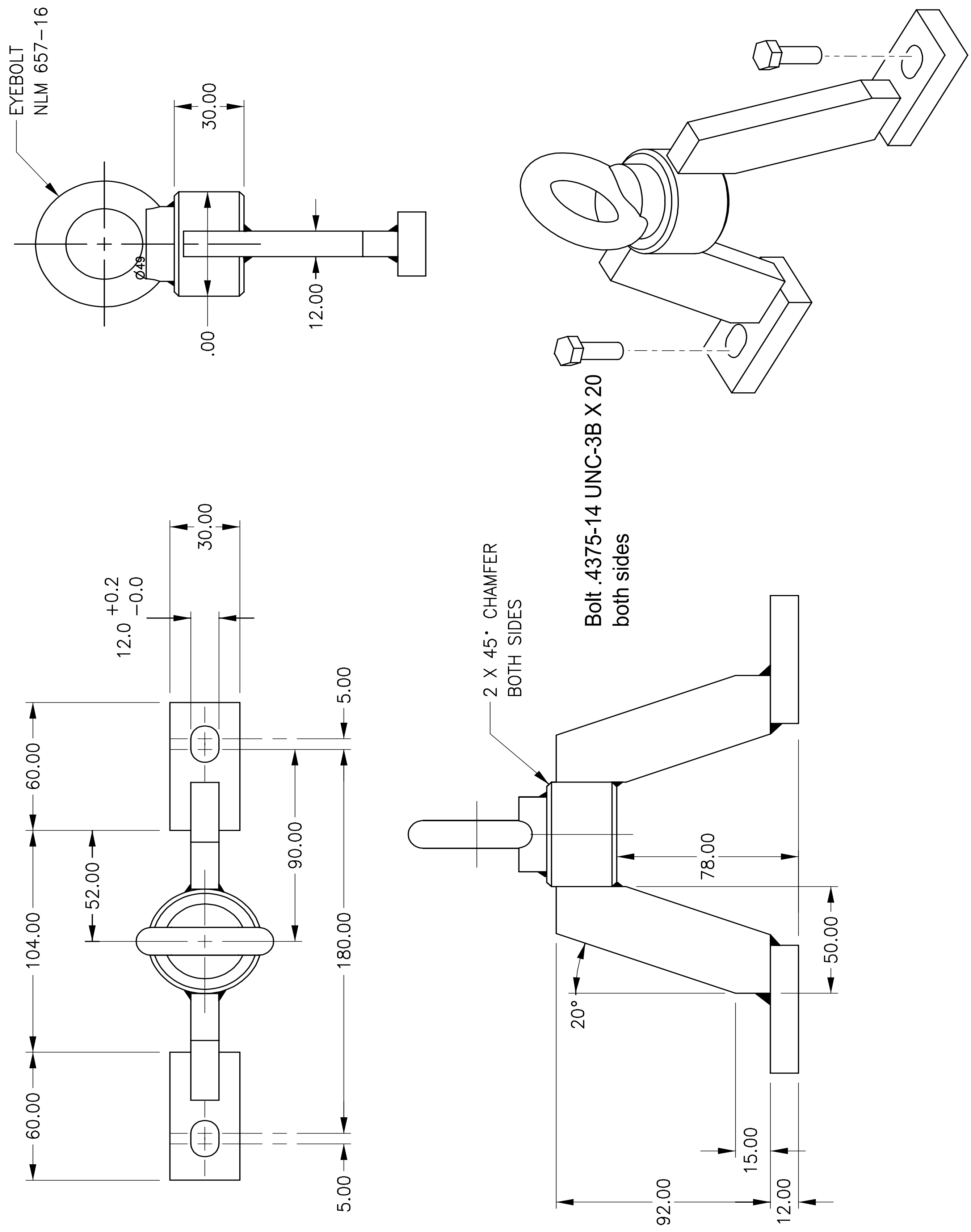


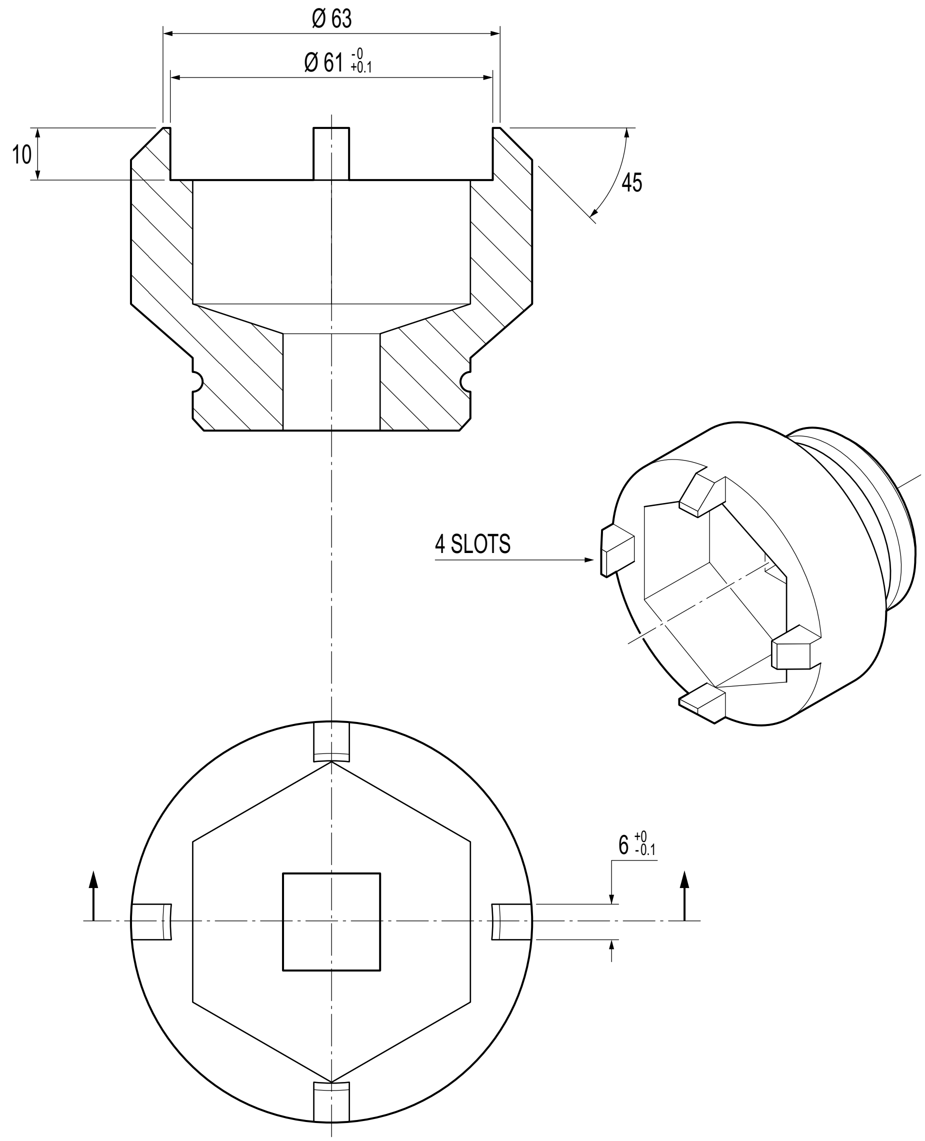

75.00
15.00
15.00
25.00
35.00
60.00
Ø40.2 +0.2 −0.0
Ø50.50 +0.20 −0.00
Ø60.00

A — A


Eyebolt M16
Bolt M10 x 40


290.00
216.00
10 x 45° 4 PLACES
17.00
32.00
Ø11.00
Ø46.00
90.00
9.00
38.00
130.00
30.00
290.00


EYEBOLT
NLM 657-16
Bolt .4375-14 UNC-3B X 20
both sides
2 X 45° CHAMFER
BOTH SIDES
30.00
12.00
.00
ø49
12.0 +0.2 −0.0
60.00
104.00
52.00
90.00
180.00
5.00
78.00
50.00
20°
15.00
92.00


Ø 63
Ø 61 -0 +0.1
10
45
4 SLOTS
6 +0 -0.1

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